State of Maine
Substance Abuse Treatment Needs Assessment

Study 4: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine

Maine Office of Substance Abuse
Department of Mental Health, Mental Retardation, and Substance Abuse Services
June 1999

CSAT
Center for Substance Abuse Treatment
SAMHSA

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FINAL REPORT

Prepared in Collaboration with
the
Maine Office of Substance Abuse

by

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Executive Summary

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Introduction and Approach

This report presents findings from a study designed to estimate the numbers and percentages of adults needing substance abuse treatment in the 16 counties and three Department of Mental Health, Mental Retardation, and Substance Abuse Services (DMHMRSAS) regions within Maine. Various types of treatment issues were estimated, including heavy alcohol and illicit drug use, need for intervention, and need for treatment for substance abuse problems. The estimates were based on results from logistic regression models exploring the association between a set of social indicators obtained from archival data sources and substance use rates obtained from a 1997 telephone survey of Maine's household population.

Data on 45 social indicators believed to be linked with substance abuse were collected at the county level across multiple years. These variables reflect indices of community sociodemographics, health, and welfare. Through statistical analysis, the full set of social indicators was reduced to a smaller number of representative variables. The analysis identified six distinct groups of interrelated indicators. The concepts represented by the groups were: Residential Characteristics, Community Crime and Violence, Social Consequences of Substance Abuse, Racial/Ethnic Composition, Socioeconomic Deprivation, and Single-Parent Families.

Highlights of the Findings

Statistical models that mathematically combined the social indicator values to form estimates of treatment needs were conducted for each issue. At the county level, these *model-based* estimates are believed to be superior to estimates based solely on the household survey data because of the relatively small survey sample sizes for individual counties. Another benefit of the model-based estimates is that they may be updated as new indicator data become available without the expense of conducting another large-scale household survey.

Association between Social Indicators and Treatment Outcomes: Key Findings

- For heavy alcohol use, need for alcohol treatment, and need for drug treatment, the social indicator for the percentage of males aged 15 to 34 years was the only significant predictor. The correlation was always in the same direction, implying that the higher the percentage of males aged 15 to 34 in a county, the higher the percentage of the adult population who engaged in heavy drinking, had a need for alcohol treatment, and had a need for drug treatment.

- For illicit drug use and the need for drug intervention, indicators for the percentage of males aged 15 to 34 and the population density were significant predictors. This finding suggests that the more densely populated a county and the higher the percentage of the population who are males aged 15 to 34, the higher the percentage of the adult population who used illicit drugs and who needed drug intervention.

- Indicators for the percentage of males aged 15 to 34 and the percentage of the population living in urban areas were the best predictors of the need for alcohol intervention. This finding implies that counties with higher concentrations of males aged 15 to 34 and higher percentages of people living in areas defined as urban have a greater need for alcohol intervention.

Overall, the analyses suggest that the need for substance abuse services is higher in counties with high percentages of people living in areas defined as urban, high population densities, and high proportions of young males in the population. The analysis also showed that treatment needs in Maine can be estimated reasonably well with these variables alone and that the other social indicators examined in the study did not significantly improve the estimates.

Generating County-Level Estimates of Substance Use Outcomes

After constructing the models, the results were used to generate county and regional estimates of heavy drinking, illicit drug use, need for intervention, and need for treatment. In order to examine the accuracy of the model-derived estimates, they were compared with the 1997 Maine household

telephone survey estimates of substance use and need for treatment. Estimates from these two studies generally differed by less than 1%. The similarity of these results helps to validate the effectiveness of social indicator modeling and highlights the potential application of modeling approaches for generating county-level estimates of treatment or intervention needs in the absence of annual population surveys.

Prevalence of Substance Abuse Intervention or Treatment Needs: Key Findings

- The findings from this study indicate that rates of intervention and treatment needs vary appreciably across counties. For example, compared to the statewide averages shown in Table ES.1, the percentage of adults in need of services ranged from 14.13% to 20.88% for alcohol intervention, 2.79% to 6.82% for drug intervention, 4.83% to 8.58% for alcohol treatment, and 1.39% to 2.47% for drug treatment. Thus, depending on the outcome of interest, some counties had service need rates 1.5 to 2.4 times higher than others.

- The prevalence rate of intervention needs for both alcohol and drugs was highest in Region I, while the prevalence rate of treatment needs was highest in Region III.

- The three highest alcohol intervention prevalence rates were distributed across the three regions in the following counties: Androscoggin, Penobscot, and Cumberland. Conversely, the highest alcohol treatment need prevalence rates were clustered in Region III (Penobscot and Aroostook counties).

- Higher prevalence rates of drug intervention needs were found in Regions I and II (Cumberland, Androscoggin, York, and Sagadahoc counties). Similar to the pattern for alcohol treatment needs, higher drug treatment prevalence rates were grouped in Region III in Aroostook and Penobscot counties.

- The counties with the greatest proportion of adults in need of alcohol services were Cumberland, Androscoggin, and Penobscot, while the counties with the highest percentage of adults with a combined need for treatment services were Penobscot, Aroostook, and Sagadahoc.

Table ES.1 Estimated Percentages and Numbers of Adults Aged 18 or Older in Need of Substance Abuse Intervention or Treatment

Region/County	Need for Alcohol Intervention (%)	Need for Alcohol Intervention (No.)	Need for Drug Intervention (%)	Need for Drug Intervention (No.)	Need for Alcohol Treatment (%)	Need for Alcohol Treatment (No.)	Need for Drug Treatment (%)	Need for Drug Treatment (No.)	Need for Alcohol or Drug Intervention (%)	Need for Alcohol or Drug Intervention (No.)	Need for Alcohol or Drug Treatment (%)	Need for Alcohol or Drug Treatment (No.)
Region I												
Cumberland	20.40	38,801	6.82	13,036	7.66	14,641	2.20	4,205	23.92	45,721	8.78	16,782
York	19.82	23,751	4.78	6,001	6.68	8,386	1.92	2,410	20.50	25,735	7.52	9,440
Total	20.17	62,552	6.01	19,037	7.27	23,027	2.09	6,615	22.56	71,456	8.28	26,222
Region II												
Androscoggin	20.88	16,197	5.66	4,391	7.40	5,740	2.12	1,645	23.34	18,106	8.44	6,547
Franklin	16.23	3,575	3.34	736	6.48	1,427	1.86	410	16.37	3,606	7.26	1,599
Kennebec	18.88	16,652	4.34	3,828	6.45	5,689	1.85	1,632	20.02	17,658	7.22	6,368
Knox	16.52	4,671	3.58	1,012	5.18	1,465	1.49	421	16.90	4,778	5.59	1,580
Lincoln	14.13	3,313	3.20	750	4.83	1,133	1.39	326	14.13	3,313	5.14	1,205
Oxford	15.77	6,209	3.16	1,244	5.66	2,229	1.62	638	15.77	6,209	6.20	2,441
Sagadahoc	19.49	4,886	4.78	1,198	7.75	1,943	2.23	559	21.07	5,282	8.90	2,231
Somerset	17.28	6,475	3.23	1,210	6.21	2,327	1.78	667	17.31	6,487	6.91	2,589
Waldo	16.01	4,125	3.35	863	5.75	1,479	1.65	425	16.16	4,164	6.31	1,626
Total	18.00	66,103	4.15	15,232	6.38	23,432	1.83	6,723	18.95	69,603	7.13	26,186
Region III												
Aroostook	19.37	11,861	3.77	2,309	8.28	5,070	2.38	1,457	19.94	12,210	9.58	5,866
Hancock	16.43	6,137	3.36	1,255	6.20	2,316	1.78	665	16.59	6,196	6.90	2,577
Penobscot	20.46	22,801	4.12	4,591	8.58	9,562	2.47	2,753	21.38	23,827	9.97	11,111
Piscataquis	15.21	2,096	2.79	385	4.89	674	1.40	193	15.21	2,096	5.21	718
Washington	15.36	4,132	3.10	834	5.73	1,541	1.64	441	15.36	4,132	6.29	1,692
Total	18.76	47,027	3.74	9,374	7.64	19,163	2.20	5,509	19.33	48,461	8.76	21,964
Statewide	18.94	175,682	4.67	43,643	7.02	65,622	2.02	18,847	20.28	189,520	7.96	74,372

Number in Need of Substance Abuse Intervention or Treatment Services: Key Findings

In addition to examining the prevalence rates (i.e., the proportion of adults in need), we explored the estimated number of adults needing services within each county and DMHMRSAS region. The number in need is affected by the population count as well as the overall rate of need; thus, a county with a lower prevalence rate may actually have a greater number of individuals in need if the population size is much larger.

- Overall, an estimated 189,520 people needed substance abuse intervention and 74,372 needed substance abuse treatment.

- The greatest numbers in need of *alcohol or drug intervention* were found in Region I, particularly in Cumberland County.

- The number in need of *alcohol or drug intervention* ranged from a low of 2,096 in Piscataquis County to a high of 45,721 in Cumberland County.

- Region I also had the greatest number of people in need of *alcohol or drug treatment*, although the difference between the regions was not large.

- The number of adults in need of *alcohol or drug treatment* ranged from 718 in Piscataquis County to 16,782 in Cumberland County. (See Figure ES.1.) In some cases, counties with rates below the state average had a higher number of people requiring services because of the high population count in that area (e.g., Kennebec and York counties). As such, substance abuse planners must take into account differences in the prevalence rates of substance abuse treatment needs as well as differences in the actual counts of people requiring services when deciding how to allocate resources and geographically place services.

As determined by the statistical models, in general, counties with higher proportions of young males and more densely populated and urban areas were more likely to need substance abuse services. Figure ES.2 shows the association between the percentage of young males in a county and the prevalence of substance abuse treatment needs.

Figure ES.1 Number of Maine Adults in Need of Alcohol or Drug Intervention or Treatment, by County

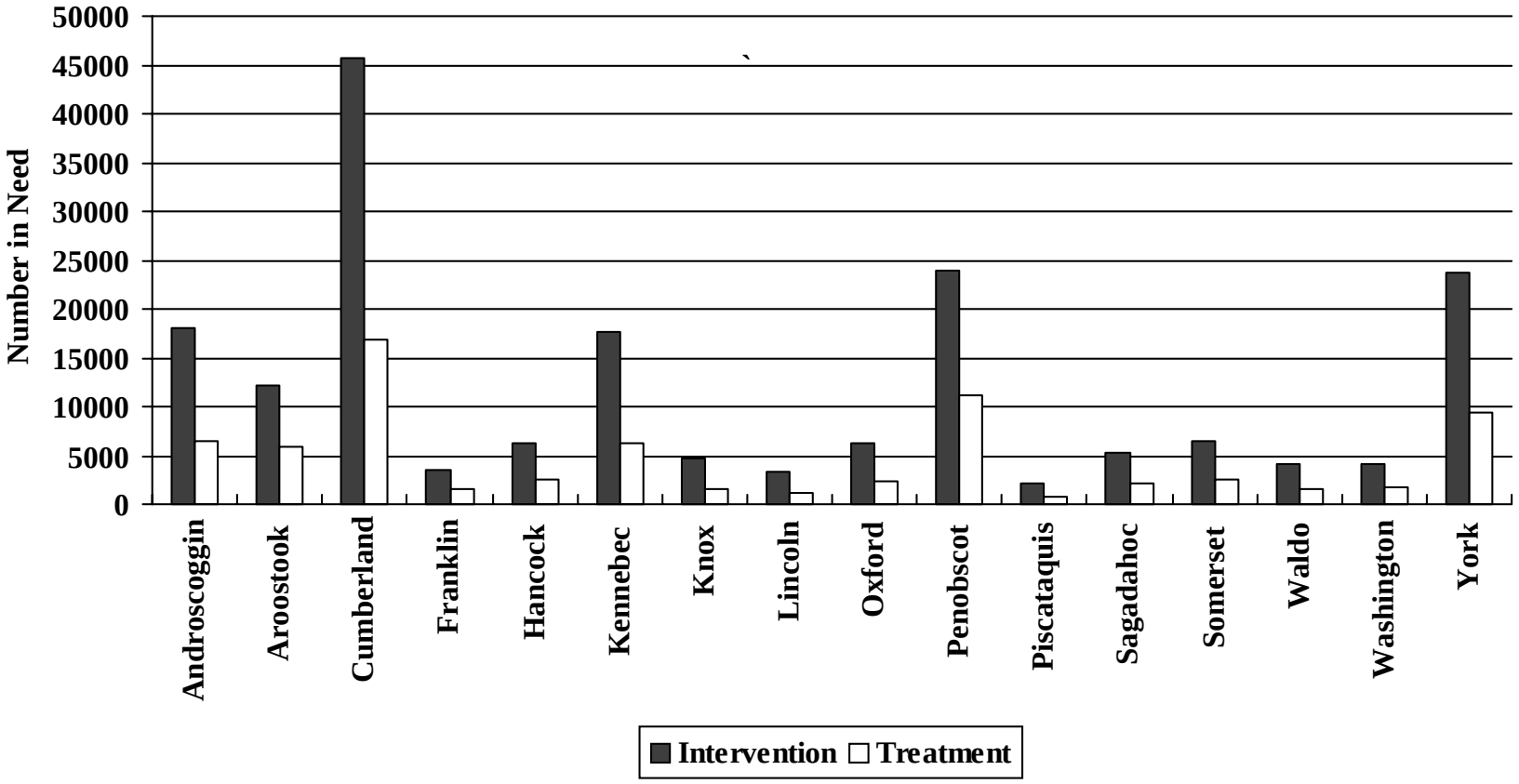
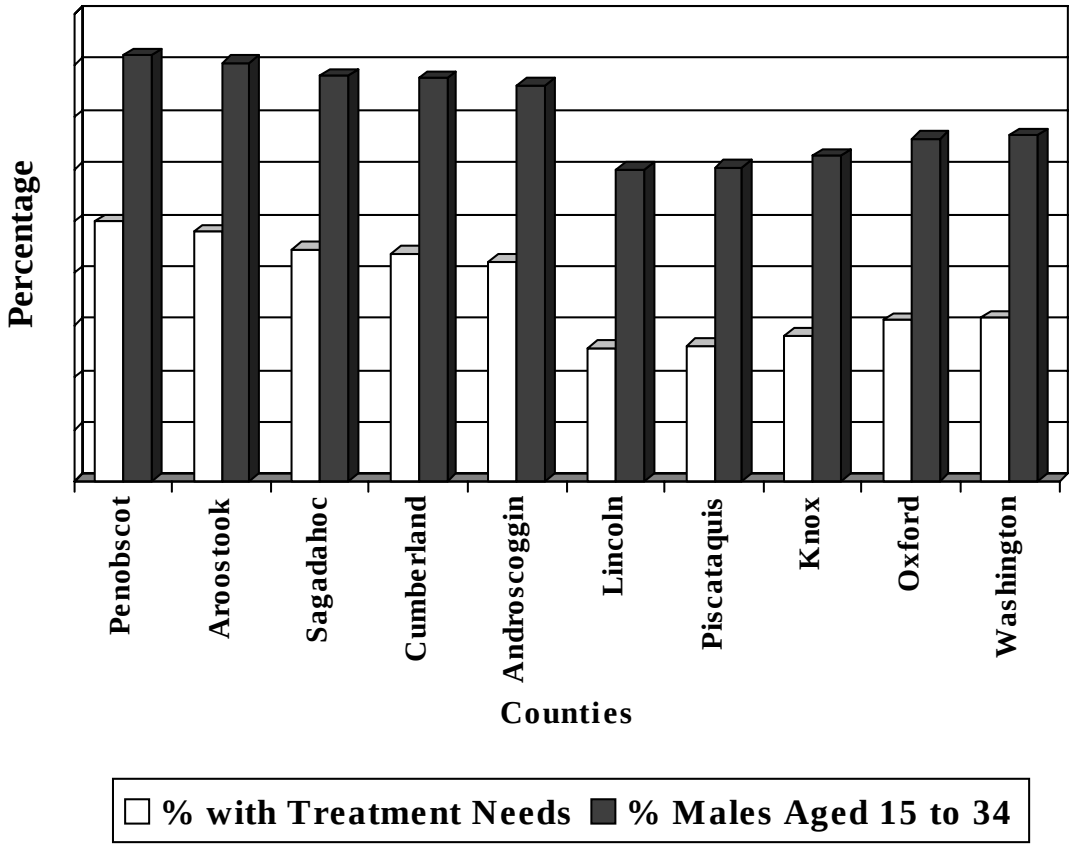


Figure ES.2 Association between Treatment Need Rates and the Proportion of Males Aged 15 to 34 in a County: Comparison of Five Counties with the Highest Prevalence of Treatment Needs Versus Five Counties with the Lowest Prevalence of Treatment Needs



Implications

These findings suggest that in the absence of up-to-date, comprehensive population surveys designed to provide county-level prevalence rates, modeling procedures using social indicators can be very useful in estimating the extent of and differences in substance abuse treatment and intervention needs across counties in the state of Maine. Moreover, model-generated estimates can be updated as more recent social indicators and population estimates become available. Extensions of these methods to smaller geographic areas within counties also may prove to be both feasible and useful.

1. INTRODUCTION

This study represents one of a series of studies conducted to assess substance abuse treatment needs in Maine. Although most of the other studies in the Maine demand and needs assessment family of studies relied upon direct methods for obtaining information about substance abuse need for treatment, this study employed indirect methods to estimate county-level prevalence of substance abuse problems. Specifically, this study utilized a social indicator approach to estimate the proportion of adults in Maine counties at risk for or abusing alcohol or drugs. Social indicator studies rely on existing social, economic, and population data available through state and federal government agencies. The assumption behind social indicator studies is that many of these community characteristics reflect the degree to which problems such as substance abuse exist within a community (McAuliffe et al., 1993). This report:

- summarizes the utility of, and current thinking behind, social indicator studies as an indirect approach to treatment needs assessment;
- develops and describes a methodology for generating indicator-based estimates;
- identifies a set of indicators for estimating treatment needs; and
- provides treatment planning and resource allocation agencies with county-level indirect estimates of the number of adults who need substance abuse treatment or intervention or who are at high risk of needing intervention based on a model utilizing uniformly collected and readily available archival data.

This chapter introduces the concepts and objectives that characterize social indicator approaches to assessing treatment needs. Chapter 2 describes the data sources and statistical methods used in the study. Chapter 3 includes the results of the logistic regression models to predict treatment need and the estimated prevalence of intervention or treatment need by county. We also discuss the degree to which changes in levels in the social indicators can be used to estimate changes in the levels of treatment need. Chapter 4 summarizes the findings and discusses both the limitations of the methodology and its potential applications for treatment service planning and resource allocation.

1.1 Overview of the State Needs Assessment Project

Substance abuse has been called the Nation's number one health problem (Horgan, Marsden, & Larson, 1993). Numerous studies have documented the negative consequences associated with substance abuse, including poor health, disrupted social relations, decreased

work productivity, inability to maintain employment, and inability to perform role functions (e.g., parenting) (Grant, Chou, Pickering, & Hasin, 1992). In addition to the toll substance abuse takes on the individual, the repercussions often extend to the community in terms of increased accidents, crime, and other social ills, including child abuse and domestic violence. Although difficult to treat, substance abuse is not intractable. Research shows that treatment of substance abuse is successful in reducing or eliminating use and the symptoms associated with abuse. Furthermore, treatment has proven cost-effective. Decreased crime and health care costs and increased employment and productivity have been correlated with substance abuse recovery (Gerstein et al., 1994; Hubbard et al., 1989).

Given the high prevalence of substance misuse among certain population groups and the devastating personal and social impact of substance abuse, treatment is a high priority for state and federal government. As such, the state of Maine has undertaken a large research project to assess the need and demand for drug and alcohol abuse treatment. Maine's demand and needs assessment project is a family of studies designed to provide valid and reliable data to facilitate short- and long-term planning of substance abuse treatment and to aid in the implementation of effective and cost-efficient services. The specific objectives of the project are to:

- develop statewide, substate, and county-level estimates of alcohol and other treatment needs for the total population and for key subgroups;
- determine the extent to which these needs are being met by the current treatment system;
- develop low-cost, valid methodologies that can be used by the state in subsequent years to estimate treatment needs; and
- identify key gaps in Maine's current data collection efforts relating to needs assessment.

To achieve these goals, the demand and needs assessment project consists of six studies. These studies were selected to achieve coverage of the State's different population groups, to provide reliable information on met and unmet treatment needs, and to develop tools that can be used by the State in the future for estimation and planning. The project includes a range of methodologies, including telephone interviewing, computer-assisted personal interviewing (CAPI), record abstraction, analytic modeling, and integrative analyses, which together provide a comprehensive base of information for Maine to continue to improve its efforts to meet the alcohol and drug abuse treatment needs of its population. The six studies are as follows:

- Study 1: Alcohol and Other Drug Household Estimates;

- Study 2: Use of Alcohol and Illicit Drugs and Need for Treatment Among Maine Adult Arrestees;
- Study 3: Estimating Need for Treatment or Intervention Among Youth in Maine Counties: A Synthetic Estimation Approach;
- Study 4: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine;
- Study 5: Assessment of Maine's Substance Abuse Treatment System: Structure, Capacity and Utilization, 1997;
- Study 6: Integrated Population Estimates of Substance Abuse Treatment and Intervention Needs in the state of Maine.

Results from these findings also are designed to help policymakers and planners decide how to allocate substance abuse treatment resources efficiently and effectively to meet the service needs of the people in the state.

1.2 Overview of the Social Indicator Study

This report presents findings from a study that estimates treatment needs for counties within Maine based on social indicators obtained from archival sources. Although the majority of studies in the "family" were designed to provide prevalence estimates based on samples of Maine's general and high-risk populations, the purpose of this study was to develop estimates of treatment need based on already available data. This study is especially significant because it is the only study within the needs assessment project that generates estimates of treatment need for each county in the state.

The underlying premise of this approach is that social, demographic, and economic characteristics of counties or local planning entities are associated with substance use and treatment need, and these characteristics (i.e., social indicators) are already available through existing sources. Examples of social indicator data available through federal or state government agencies include the median household income; the proportion of the population by age, gender, and ethnicity; the rate of alcohol- or drug-related traffic accidents; and the violent crime rate.

Although surveying the population directly on the use of substances and the need for treatment services is probably the best approach for obtaining information, social indicator studies may provide an alternative to obtaining data when large-scale surveys are not possible or feasible. The benefits of social indicator studies include lower cost and less time commitment. Social indicator studies also may offer some alternatives to the methodological limitations

associated with primary data collection. For example, social indicator studies are less likely to be affected by the potential underreporting of undesirable or illegal behaviors such as drug use. Moreover, social indicators can provide estimates of treatment need for small areas (such as counties), which is often impractical in surveying because of the large sample sizes and the high costs needed to obtain reliable small area estimates.

Potential biases and inconsistencies in how social indicator data are collected remain a significant issue in the development of this approach. Challenges include validating the indicators by determining their relative strength of association with the level of need and developing procedures to combine indicator data into a useful composite for estimating treatment need. This report describes our efforts to address these challenges by developing an empirical model of the relationship between social indicators and measures of intervention or treatment need. We recognize that this study represents one of the first of its kind and, thus, will benefit from continued methodological refinement and validation. Nevertheless, we expect that the county-level, model-derived estimates of treatment need based on social indicators will be more accurate than estimates based purely on capitation strategies and also may be preferable to directly estimating need based on small-sample household surveys. Thus, we believe that the estimates provided by this study are probably more precise at the county level than others currently available to the state. Although further refinements and validation of this approach will be necessary, we expect that social indicator modeling may ultimately prove useful as a systematic and cost-effective approach for estimating county-level treatment needs in Maine. In particular, this strategy allows for updating estimates of substance abuse treatment needs on a regular basis and at a lower cost as new archival data become available.

1.3 Rationale for Developing a Social Indicator Approach to Treatment Service Needs Assessment

The goal of needs assessment studies is to determine the types, numbers, and geographic distributions of people needing services. Needs assessments can employ both direct and indirect methods of gathering information. Direct methods include conducting field surveys to ascertain the number of people in the population who meet diagnostic or other designated criteria of need.

Two distinct yet related approaches for indirectly assessing treatment needs are recognized in the literature. Both approaches have been available for many years, although debate regarding their utility and refinements in their methodology and application continues. The first approach, *synthetic estimation*, has been used primarily to develop estimates of drug use prevalence in small areas, usually when area-specific population survey data are not available. Useful reviews of this method are provided by Levy (1979) and Rhodes (1993). In this approach, findings from drug use surveys conducted on larger populations (e.g., national or statewide

surveys) are extrapolated to the target areas. Estimates are adjusted for population characteristics of the target areas (e.g., age, race/ethnicity, and gender), provided that estimates of the subgroup populations in each target area are available and prevalence estimates for these subgroups are provided by whatever benchmark survey is used.

As noted by Tweed and Ciarlo (1992), synthetic estimation techniques assume that area-specific prevalence rates are not significantly influenced by factors other than those demographic variables for which adjustments are explicitly made. McAuliffe et al. (1993) argue that there is substantial variation in levels of treatment need that cannot be explained by differences in age, race, and gender and that other characteristics of local areas may serve as useful proxies for estimating treatment needs. This assumption underlies the second class of indirect estimation approaches, the use of social indicators.

Social indicator modeling has been used in mental health planning for a number of years (see Cagle and Banks, 1986; Ciarlo, Tweed, Shern, Kirkpatrick, & Sachs-Ericsson, 1992; Warheit, Bell, & Schwab, 1997). It became prominent in the 1920s at the University of Chicago as a way to investigate theories of "social disorganization." Recently, this methodology has been applied to substance abuse treatment needs assessment (McAuliffe et al., 1993; Simeone, Frank, & Aryan, 1993). The approach is based on the assumption that certain characteristics of subpopulations (e.g., as defined geographically by county) are correlated with substance use. If reliable measures of these correlates are available, then they may be used as surrogate measures, or indicators, of the actual prevalence of use and need for treatment. A mathematical model useful for estimating the level of treatment need based on values of social indicators, and calibrated using survey-based estimates, can then be developed. Model-based estimation of treatment needs may serve as a resource allocation tool. The application of such approaches is based on principles of equitable distribution that contend that an area's share of the resources should be equivalent to its proportion of the problem (Simeone et al., 1993).

Several states have recently applied the social indicator approach to assessing substance use treatment and prevention needs. These efforts have produced compendiums of indicators, organized by county or by some other relevant geographic unit (e.g., Minnesota Department of Public Health, 1994; Shukitt-Hale et al., 1994; University of Maine, 1991; Zechmann, Flewelling, & Van Eenwyk, 1995). These documents provide extremely useful information to planners regarding their area's absolute and relative ranking on a number of measures believed to be either directly or indirectly related to substance abuse. Such data are useful for gauging the probable level of substance abuse problems in an area and for better understanding the populations being served and the social environmental context in which they live. The value of

such data is enhanced if they are accompanied by information on the relative importance of each indicator with respect to predicting drug use and/or drug-related problems and treatment needs.

Compendiums of indicators cannot, however, provide a single, overall assessment of the level of treatment needs in a particular area. In order to provide this, some method of weighting and combining the various indicators is required. One of the key challenges in the treatment needs assessment effort is constructing a meaningful composite of indicators. In a study conducted in Illinois, Sherman and Gillespie (1995) reduced an initial set of 64 social indicators thought to be related to substance abuse to 8 statistically independent factors that accounted for more than 80% of the original variance. The researchers then used these factors in a statistical model to estimate treatment service needs. Unmet service needs were determined by subtracting the number of clients predicted by the model from the actual number of clients served.

Critical to accurate estimation is the operationalization of "need" in the predictive model. Some states have relied on treatment utilization as the criterion (or proxy) for need. The logic of using a treatment service utilization measure as a criterion for developing a model to predict treatment service needs is debatable. Of chief concern, the model does not take into account underutilization due to limited access or finances and may bias resource allocation in favor of areas with high levels of current service use. Thus, those in need who have not utilized treatment are omitted from the "criterion" measure. To address this weakness, the state of Maine in conjunction with Research Triangle Institute (RTI) conducted a social indicator study to predict the number of persons in need of treatment. The model was designed to predict county-level estimates of problem alcohol or drug use within the past year as derived from a telephone household survey measuring risk or need for treatment. Expanding the models to include all persons in need of treatment rather than only those who utilize services may lead to different conclusions regarding the relationships between social indicators and treatment needs. This study found that social indicators are capable of explaining a significant proportion of the variance in models predicting levels of use and substance abuse treatment need (Flewelling et al., 1998).

A critical challenge for developing useful social indicator models is to specify conceptually what the models should estimate and then to identify appropriate criterion measures with which to develop the models One obvious criterion with which to develop a model to provide estimates of treatment needs is the prevalence of substance abusers or substance-dependent individuals in a county. For this study, we use county-level estimates of substance abuse problems provided by the Maine household telephone survey. Although the precision of these estimates for most counties is not adequate to use them directly to assess the level of treatment needs, the survey-based estimates do provide a metric for calibrating social indicator

models. Due to the relatively low prevalence of clinical levels of substance abuse and dependence, we have expanded the criterion variables to include other indicators of treatment needs, including the proportion of individuals classified as being in "need of intervention," as well as the percentage of heavy drinkers and illicit drug users.

2. METHODOLOGICAL APPROACH

To estimate the need for substance abuse treatment or intervention at the county level, we examined the relationship between social indicators that characterize each county and a set of county-level measures of treatment need. When employing the social indicators for treatment planning purposes, the unit of analysis becomes the county rather than the person, thereby reducing the sample size for these analyses. Because of the potentially large number of explanatory variables in the model, the small number of counties in Maine (16) could not support the required analysis. To address this problem, the sample size was augmented by adding data from the neighboring state of Vermont. This strategy doubled the number of data points (30) and provided an adequate sample size for model development. The state of Vermont has conducted a comparable telephone household survey, with measures of substance abuse treatment need operationally defined similar to the Maine telephone household survey. The indicators collected for these two states were basically equivalent and, for the most part, measured in the same way. Indicators that were collected in only one state or which were measured differently were excluded from analysis. Although using data from other states was considered, Vermont provided the most acceptable source of complementary data based on its social, economic, and demographic similarities to Maine, as well as the geographic proximity of the two states.

Before developing the social indicator models, we conducted factor analysis on the large number of social indicators to identify a reduced number of predictors. Then, using multivariate logistic regression techniques, we developed models for estimating heavy drinking, illicit drug use, and substance abuse intervention or treatment needs based on this smaller set of social indicators.[1] We next derived estimates from the models to generate the proportions of adults in each county needing substance abuse treatment or intervention. Finally, we showed how parameters obtained from the regression models may be used to predict future levels of substance abuse and treatment need.

2.1 Data and Sample Weights

The data on alcohol and illicit drug use and the need for substance abuse treatment that serve as our criterion variables (or dependent variables) in developing the social indicator models were obtained from the 1997 telephone survey of Maine's adult household population. The survey included a stratified random sample of 4,042 adults. Stratification variables were age and

[1]Logistic regression was used because the response variables represent proportions of the population. This method builds a linear model for the logit [$\log(p/(1-p))$] of the response probability p.

gender. The survey design and methods are described in detail in the final report for the statewide adult study (Kroutil et al., 1998).

Because the sampling method was stratified, observations were weighted to ensure that county-level estimates were unbiased. Weights were developed using 1994 information provided by the U.S. Bureau of the Census. Age and gender cross-classification cells used to develop the weights were based on three age groupings (18 to 29, 30 to 44, and 45 or older) and the two gender categories. To ensure proper variance estimates, the sum of the weights for any county was set equal to the number of observations for that county.

2.2 Selection of Criterion Measures for the Models

Ideally, the criterion measure to use in calibrating a social indicator model for estimating treatment needs would be the prevalence of persons in each county in need of treatment. A distinction would be made between the need for alcohol abuse treatment and the need for drug abuse treatment. In the Maine household telephone survey of adults, a determination was made for each respondent with respect to their treatment need status. The following outcome measures were selected from the household survey data:

- past year heavy drinking,
- past year illicit drug use,
- need for alcohol intervention,
- need for drug intervention,
- need for alcohol treatment, and
- need for drug treatment.

Treatment needs were defined according to whether a person had experienced serious adverse effects of alcohol or drug use or reported a pattern of substance use that strongly suggested the existence of a problem. More specifically, individuals were determined to be in need of treatment if 1) they met lifetime criteria for alcohol or drug abuse or dependence as described in the third, revised edition of the American Psychiatric Association's (APA's) Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R) (1987); 2) used alcohol and/or drugs within the past 12 months; and 3) had one or more symptoms of dependence or abuse in the past 12 months. Need for treatment also was extended to include those exhibiting a problem pattern of use. Those defined as problem users also met DSM-III-R (1987) lifetime diagnostic criteria and reported at least one of the following:

- binge drinking in the past year,[2] or
- consumption of eight or more drinks on average in a 24-hour period (six or more drinks for women) in the past year, or
- heavy alcohol consumption in the past year defined as consuming on average five or more drinks in a 24-hour period (four or more drinks for women) at least once a week in the past year, or
- consumption of five or more drinks in a 24-hour period (four or more drinks for women) on 4 or more days in the past month.

For drugs other than alcohol, individuals were defined as having a current pattern of problem use in the past 12 months if they indicated:

- use of marijuana at least once a week, or
- use of hallucinogens at least once a week, or
- any use of cocaine (including crack), or
- any use of heroin or other opiates, or
- use of stimulants for nonmedical reasons at least once a week.

Need for intervention, a less restrictive criterion for determining problem levels of use, includes individuals who did not meet lifetime diagnostic criteria for substance abuse or dependence but who reported symptoms of abuse, or a problem pattern of use, and used alcohol or drugs within the past 12 months. The prevalence rates were defined simply as the estimated percentage of adult respondents aged 18 years or older in each county or county cluster who met the criteria for each measure. A detailed explanation of the criteria used in determining need for intervention or treatment is provided in the Maine household survey report (Kroutil et al., 1998).

As can be seen in Table 2.1, the statewide prevalence rates for treatment need are not very large; thus, county-level estimates tend to be based on small numbers of respondents who meet the criteria. Therefore, we also included risk indicators of substance abuse, namely heavy drinking and past year illicit drug use as criterion variables in the model. These variables are

[2]Respondents were asked whether they had "ever gone on binges where they kept drinking for a couple of days or more without sobering up."

Table 2.1 Estimated Percentage of Adults in Maine in Need of Treatment or Intervention or Who Used Illicit Drugs or Drank Heavily in the Past Year

Treatment Need Measure	Percentage of Adults
In Need of Treatment	
Alcohol only	7.0
Drug only[a]	1.9
Alcohol or drug	8.1
In Need of Treatment or Intervention	
Alcohol only	18.7
Drug only	4.6
Alcohol or drug	20.8
Use in Past Year	
Any core illicit drug	10.3
Heavy drinking	9.5

[a]Marijuana or hashish, hallucinogens, cocaine (including crack), heroin/opiates, or stimulants.

Source: Maine household survey report (Kroutil et al., 1998).

correlated with need for intervention and treatment and have a higher prevalence in the population; thus, they may generate more stable models.

2.3 Selection of Social Indicators to Use as Predictors

The research literature on area-based attributes that could be used to indicate the level of substance use treatment need is still sparse and largely exploratory. Therefore, in order to identify a comprehensive list of potential indicators, the selection of indicators used for this study was based primarily on an extensive review of the literature on social and psychosocial predictors of substance use among adolescents (Hawkins, Catalano, & Miller, 1992). In their review, Hawkins and colleagues identified 17 "risk and protective factor" constructs as predicting substance use in longitudinal design studies. Most of these constructs are conceptually and/or empirically associated with adult substance abuse.

For this study, we revised the list of measures and reorganized them into eight broad and conceptually meaningful categories. Although most of these variables were identified based on their association with use rather than dependency or need for treatment, it is assumed that many of them may exhibit an association with dependency and more problematic forms of use. The categories, and the measures used for each, are displayed in Table 2.2.

Table 2.2 State of Maine: Social Indicators

		Years
A.	**Alcohol and Drug Abuse Indicators**	
1.	Juvenile arrest rate for alcohol law violations	1990 - 1994
2.	Juvenile arrest rate for drug use or possession	1990 - 1994
3.	Adult arrest rate for alcohol law violations (except operating under the influence [OUI])	1990 - 1994
4.	Adult arrest rate for drug use or possession	1990 - 1994
5.	Adult OUI arrest rate	1990 - 1994
6.	Adult admission rate to publicly funded treatment programs	1990 - 1993
7.	Juvenile admission rate to publicly funded treatment programs	1990 - 1993
8.	Alcohol-related death rate	1991 - 1995
9.	Alcohol-related hospital admission rate	1991 - 1995
10.	Drug-related death rate*	1991 - 1995
11.	Drug-related hospital admission rate	1991 - 1995
B.	**Community Disorganization and Transition**	
1.	Percentage of residential properties that are renter-occupied	1990
2.	Percentage of residential properties that are unoccupied	1990
3.	Divorce rate	1989
4.	Percentage of adult population registered to vote	1990,1992,1996
5.	Percentage of adults voting in last presidential election	1992 &1996
6.	Percentage of population that moved from outside county	1990
7.	Percentage of population that moved within county	1990
C.	**Levels of Community Crime and Violence**	
1.	Adult arrest rate for violent index crimes	1990 - 1994
2.	Adult arrest rate for property index crimes	1990 - 1994
3.	Adult arrest rate for other nonalcohol or other drug (non-AOD) crimes	1990 - 1994
4.	Juvenile arrest rate for violent index crimes	1990 - 1994
5.	Juvenile arrest rate for property index crimes	1990 - 1994
6.	Juvenile arrest rate for other non-AOD crimes	1990 - 1994
D.	**Demographic Characteristics**	
1.	Percentage of population who are males aged 15 to 34	1990 - 1994
2.	Percentage of population who are white	1990 - 1994
3.	Population density	1994
4.	Percentage of population living in urban areas	1990
E.	**Socioeconomic Deprivation**	
1.	Percentage of persons living below poverty level	1990
2.	Percentage of children living below poverty level	1990
3.	Percentage of adults who are unemployed	1992 - 1996
4.	Percentage of households receiving Aid to Families with Dependent Children (AFDC)	1993 - 1996
5.	Percentage of households headed by single parent	1990
6.	Median household income	1990
7.	Percentage of adults without high school education	1990
8.	Percentage of population receiving food stamps	1993 - 1996
F.	**Alcohol and Drug Availability**	
1.	Retail liquor outlets per capita*	1990 - 1992
2.	Distance to nearest interstate highway	1996
3.	Arrest rate for drug sales or manufacturing	1990 - 1994

See note at end of table.

(continued)

Table 2.2 (continued)

	Years
G. Academic Failure and Lack of Commitment	
1. High school dropout rate*	1989 - 1993
2. Achievement test scores - Grade 6*	
3. Achievement test scores - Grade 8*	
H. Problems Indirectly Associated with Substance Use	
1. Rate of births to teenage mothers*	1990 - 1994
2. Sexually transmitted disease rate	1990 - 1993
3. Teen pregnancy rate*	1990 - 1994

*These indicators were excluded because of differences in measurement across the two states.

See Appendix A for a description of indicator data sources.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

The indicator data obtained from a variety of state and federal agencies are described in detail in Appendix A. The indicators selected for this study are generally standard types of measures generated by the source agencies; therefore, they are expected to be based on validated and reliable data collection procedures. They were drawn from an even larger set of candidate measures in a process that eliminated measures that appeared to be inconsistently or poorly operationalized. The frequency distribution of each indicator was examined, and indicators with unusual distribution or extreme values were noted. Questions concerning data collection procedures and definitions were clarified with the source agencies before the data were used; remaining concerns and limitations of the indicator data are included in Appendix A. However, some indicators may still contain significant sources of bias or error that could not be readily discerned.

Annual data from 1990 through the most recent year available were collected. Some indicators were available for only a limited number of years and some for only a single year (e.g., 1990 U.S. Census Bureau decennial census data). To address the potential instability of measures collected over a number of years, we have averaged them to form a single rate or proportion. Values of each indicator, for each county in the state, are provided in Appendix B.

2.4 Reduction of Social Indicator Set into a Smaller Set of Discrete Constructs

Given the large number of social indicators relative to the number of counties (30)[3] and the expected high degree of correlation among the social indicators, we chose to reduce the number of variables to be used in each model through factor analysis. Factor analysis is a data

[3]Thirty is the combined total of Maine's counties (16) and Vermont's counties (14).

analytic procedure used to assess the underlying structure of a data set. Factor analysis identifies items that share common variance and groups them together into a factor. It is useful for determining the number of distinct constructs that emerge from a large set of items as well as for providing information on the degree to which variables overlap or represent a common structure.

2.5 Modeling Procedures

Maximum likelihood logistic regression was used to model the relationship between the reduced set of social indicators and the measures of heavy drinking, illicit drug use, and need for intervention or treatment of alcohol and/or drug abuse.[4] Model building was guided by past theory and research, results of the factor analysis, and examination of the bivariate correlations between the social indicators and the variables assessing treatment need. The success of these models in predicting the survey-derived measures of substance use or misuse is assessed using a goodness-of-fit (GOF) statistic, which tests whether the model residual (or unaccounted for variance) is greater than would be expected from true binomial sampling. Parameter estimates resulting from the modeling are then used to generate the prevalence of county-level treatment needs. Finally, we assess the degree to which changes in the indicators are associated with changes in levels of treatment needs. Chapter 3 presents the results of these modeling efforts.

[4]Maximum likelihood regression is based on two assumptions: 1) there is a linear relation between the logit of the response variable and a linear combination of the social indicators; and 2) the values of the observed subject-level responses are random variables from a binomial distribution with an expected value (p), which is a constant conditioned on the values of the relevant social indicators being fixed.

3. MODELING SUBSTANCE USE AND NEED FOR TREATMENT

This chapter presents results of modeling activities for the social indicator study, including the following:

- the factor analysis used to reduce the full set of social indicators to a manageable number of variables for modeling;
- the best fitting models for predicting heavy drinking, illicit drug use, and need for alcohol or drug intervention or treatment;
- the estimated proportion of adults in each region and county determined to be heavy drinkers, illicit drug users, or in need of treatment and/or intervention based on findings from the logistic regressions; and
- the standardized effects used to estimate change in intervention or treatment need based on change in the significant indicators**.**

3.1 Factor Analysis

The first step in our analyses was to estimate the number of distinct dimensions contained in the full set of social indicator variables. The number of dimensions that emerges dictates the maximum number of variables to be selected for modeling. Because variables that have a high association with the same factor may be highly correlated, they may fail to achieve significance in the final model due to item redundancy. We performed a Promax factor analysis with an oblique rotation employing all of the social indicators. This procedure resulted in separate but possibly correlated factors. Four-, five-, six-, and seven-factor solutions were tested. The six-factor solution appeared to have the most conceptually distinct factors and was considered optimal. Table 3.1 describes the six factors and identifies the variables that have the highest correlations (i.e., factor loadings) with each.

The six-factor solution accounts for almost 80% of the variance in the entire set of indicators, leaving only 20% unaccounted for. The more variance that is accounted for, the better the factors represent the full set of social indicators. Thus, the dimensions that emerge from the factor analysis are able to represent the full social indicator set reasonably well. The set of indicators that was most strongly correlated with each factor (as shown in Table 3.1) was used as the basis for identifying the underlying conceptual dimension that each factor represents.

3.1.1 Residential Characteristics

The Residential Characteristics factor accounts for 22% of the total variance. The variables that load on this factor include urbanicity, density, residential instability, percentage of young adult males, median income, and proportion of the population that is part of a minority group. The majority of variables loading on this factor appear to reflect characteristics of more densely populated urban areas, some of which have been shown to be associated with higher levels of substance use and other problems (Limber and Nation, 1998). This factor does not, however, appear to include the neighborhood deterioration and out-migration sometimes characteristic of urban areas, as reflected by the negative factor loading on unoccupied housing and the positive loading on median household income.

3.1.2 Community Crime and Violence

Eleven variables have their highest associations with the Community Crime and Violence factor, which accounts for 22% of the overall variance. Nine of the variables are indices of adult or juvenile crime, including both violent and property crimes. The remaining two variables reflect involvement in the public welfare system through receipt of Aid to Families with Dependent Children (AFDC) or food stamps.

3.1.3 Social Consequences of Substance Abuse

Of the six variables associated with this factor, four represent the social consequences of an individual's substance abuse, including the prevalence of sexually transmitted disease (STD), admissions into drug and alcohol treatment centers, drug-related hospitalizations, and arrests relating to drug manufacturing. The negative loading of the drug-related hospitalization rate, however, is contrary to the expected pattern and indicates that this variable is probably not a valid county-level indicator of substance abuse problems or consequences. The negative loadings for in-migration and voter participation are consistent with the expectation that these indicators should be **lower** in areas with higher levels of substance use consequences. This factor accounted for 14% of the total variance in the indicator data set, and the relatively low factor loadings on the component variables suggests that it is harder to define and measure empirically than some of the other factors.

Table 3.1 Items and Factor Loadings That Form the Six Factors

Residential Characteristics	Community Crime and Violence	Social Consequences of Substance Abuse	Racial/Ethnic Composition	Socioeconomic Deprivation	Single-Parent Families
Percentage of residential properties that are renter-occupied (.92)	Adult arrest rate for other non-alcohol and other drug (non-AOD) crimes (.98)	Percentage of population that moved from outside county (-.71)	Percentage of population who fall into the other category (.94)	Alcohol-related death rate (.78)	Divorce rate (.60)
Percentage of population who are Asian (.90)	Adult arrest rate for drug use or possession (.92)	Drug-related hospital admission rate (-.64)	Percentage of population who are Native American (.90)	Alcohol-related hospital admission rate (.69)	Percentage of households headed by a single parent (.60)
Percentage of population living in urban areas (.88)	Juvenile arrest rate for violent index crimes (.93)	Percentage of adults voting in last presidential election (-.58)	Percentage of population who are white (-.93)	Percentage of children living below poverty level (.66)	Juvenile arrest rate for property index crimes (-.70)
Percentage of population who are black (.83)	Adult arrest rate for property index crimes (.94)	Adult admission rate to publicly funded treatment programs (.52)	Distance to nearest interstate highway (.50)	Percentage of adults without a high school education (.62)	
Population density (.77)	Adult arrest rate for violent index crimes (.92)	Adult and juvenile sexually transmitted disease rate (.73)		Percentage of adults who are unemployed (.61)	
Percentage of population who are males aged 15 to 34 years (.74)	Adult arrest rate for alcohol law violations (OUI) (.91)	Arrest rate for drug sales or manufacturing (.94)		Percentage of persons living below the poverty level (.60)	
Median household income (.68)	Adult OUI arrest rate (.89)			Juvenile arrest rate for drug use or possession (-.50)	
Percentage of population that moved within county (.54)	Juvenile arrest rate for alcohol law violations (.69)				
Percentage of residential properties that are unoccupied (-.67)	Juvenile arrest rate for non-AOD crimes (.59)				
	Percentage of households receiving Aid to Families with Dependent Children (AFDC) (.58)				
	Percentage of population receiving food stamps (.54)				

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

3.1.4 Racial/Ethnic Composition

This factor consists of three population variables, the percentage of the county who are white, Native American, or of an "other" racial or ethnic group. It basically distinguishes counties with a higher percentage of non-white population, particularly Native Americans, from those with lower percentages. The Racial/Ethnic Composition factor accounts for 13% of the total variance. The number of miles from a highway (indicating the degree to which a community is isolated) also loaded on this factor.

3.1.5 Socioeconomic Deprivation

Accounting for 12% of the total variance, the Socioeconomic Deprivation factor contains six variables. Four variables reflect indices of low social economic status, including the total poverty rate, the child poverty rate, the proportion of unemployed adults, and the percentage of the adult population without a high school degree. Two items relating to alcohol use, alcohol-related morbidity and mortality, also loaded on this factor.

3.1.6 Single-Parent Families

Only three items were appreciably correlated with this factor, which explains 6% of the total variance. Two variables include the proportion of divorced and single-parent families. The third item, the juvenile property crime index, correlates negatively with the factor. This factor is composed of variables that are largely unassociated with any other variables. Due to the low percentage of total variance explained, items forming this factor were not used in the final models.

3.1.7 Summary of Factor Analysis

The factor analysis described above was performed in order to produce a reduced number of social indicators useful for modeling. The majority of variance in the full social indicator set was accounted for by six factors representing the following constructs: Residential Characteristics, Community Crime and Violence, Social Consequences of Substance Abuse, Racial/Ethnic Composition, Socioeconomic Deprivation, and Single-Parent Families. In most cases, the direction of each factor loading was consistent with the conceptual meaning assigned to that factor. There were three exceptions, however, most notably the negative loading of the alcohol-related hospitalization rate on the Substance Abuse Consequences factor. The other counterintuitive findings were the negative loadings of juvenile arrest rates on the Socioeconomic Deprivation and Single-Parent factors.

The factor analysis serves to organize the 38[1] indicators into six empirically derived and conceptually meaningful subsets. This organizational scheme departs somewhat from the purely conceptual groupings initially developed and shown in Table 2.2, but because it is supported by the available data, it provides a more appropriate framework for guiding the variable selection for subsequent modeling procedures. Results from this analysis helped guide the model building by indicating the variables best representing the social indicator set as well as the maximum number of variables useful for modeling. Because the goal is to arrive at the most parsimonious set of indicators accounting for the variance in the measures of treatment need, use of highly related (or collinear) variables in the model would reduce its utility while adding nothing to its predictive ability. Thus, the factor analysis helped to demonstrate which variables may contribute little, given that a redundant set of variables is already in the model.

3.2 Correlations

Appendix C lists the correlations between the social indicators and the measures of heavy drinking, illicit drug use, and need for alcohol or drug intervention or treatment. Only correlations with moderate to large values (>.30) are shown. These correlations suggest that many of the indicators are strongly associated with measures of substance use and misuse. Some of the correlations are quite high, with absolute values greater than .70. Because values this large are often associated with extreme values in the data space, a visual inspection of the bivariate associations was conducted. It revealed that extreme values were not a problem.

3.3 Indicator Reliability

When selecting variables for use in modeling, measurement reliability must be considered. Reliability refers to the degree to which a similar score would be obtained given repeated attempts at measuring an observation. All measurements include a certain amount of error. For example, when the U.S. Census Bureau reports the proportion of the population who are white, the score is an estimate, probably not equal to the true population value. In selecting variables to include for modeling, we prioritized variables expected to have the lowest measurement error. Census variables are usually highly reliable and consistent in terms of operationalization and data collection procedures across the two states. On the other hand, state-level data were expected to have lower reliability because specific processes for collecting these data varied across states or even within a state. For instance, Maine and Vermont had slightly different procedures for specifying which disease classifications constituted alcohol- or drug-related hospital discharges. The Uniform Crime Reporting (UCR) data also were suspect

[1]Seven indicators were excluded from the modeling because of inconsistencies in measurements across the two states.

because many precincts did not report crime occurring within their community. Arrest rates also varied widely across counties, raising doubts about the consistency in which cases are identified and reported. Because of these concerns regarding the validity of arrest data from the UCR, these indicators were not used in the final models.

3.4 Using Social Indicators to Predict Substance Use and Intervention or Treatment Needs

Following the factor analysis, logistic regression models were created using the selected indicators. Indicators were chosen for the models based on theoretical considerations, results of the factor analysis, and pair-wise correlations between the indicators and the response variables (i.e., measures of substance use or abuse). To avoid redundancy and create the most parsimonious models, we minimized the total number of variables selected for model building. For each measure of treatment need, a guided model-building strategy was used that emphasized variables that would be salient in all models. Variables considered to be measured with the lowest error received precedence over less reliable measures. Variables were added to the model until a reasonably strong association was observed between the response variable and the set of predictors (i.e., there was a good "fit" of the model) and no additional social indicators were significant at the $p < .10$ level. Because of the association among many of the social indicators, the models presented do not represent the only model with a good fit. They were selected over other possible models in light of theoretical and data quality considerations, as well as the goal to minimize the number of predictors while achieving an acceptable level of model fit. This strategy was designed to reduce the risk of including spurious predictors in the models, thereby enhancing future reproducibility and accuracy.

Across five of the six outcome measures, the variable for the percentage of the population who are males aged 15 to 34 years showed consistently high associations. The correlation was always in the same direction, implying that higher concentrations of this population are associated with a greater likelihood of substance use or a greater need for services. This association is consistent with past research indicating that young males are at highest risk for drug and alcohol abuse (Regier et al., 1988). Finally, this measure was among those considered lowest in error. Consequently, this variable was included in every model. No other variable was found to have all of these desirable properties. Other variables were added that improved the model fit, were believed to be measured with low error, and were hypothesized to be related to community-level rates of substance abuse treatment needs.

Variables were entered into the model sequentially, always beginning with the intercept[2] and proceeding with the variable for the percentage of the population who are males aged 15 to 34 years, followed by any additional variables that enhanced the model fit. In the following sections, we describe the model development for each of the six response measures examined in the study. Summaries of the final models selected for each response are presented in Table 3.2. Each summary indicates the variable(s) included in the model, the coefficient for each variable and its level of statistical significance, and the model *p*-value statistic (Agresti, 1990), which is a measure of how well the model predicts the response variable. Model *p*-values over .10 indicate an acceptable statistical fit of the model. Alternative models with different or additional variables did not produce significantly higher model *p*-values for any of the models tested.

3.4.1 Best Fitting Models for Predicting Substance Use

As shown in Table 3.2, only one variable was needed to model heavy alcohol use, the percentage of males aged 15 to 34 years. In predicting past year illicit drug use, two indicators were retained in the model, the percentage of males aged 15 to 34 years and density.[3] More males aged 15 to 34 and a higher population density imply more illicit drug use. Both models exhibited acceptable fits with the data, as indicated by the model *p*-values of .11 and .39, respectively.

3.4.2 Best Fitting Models for Predicting Intervention Need

The modeling results for alcohol intervention need also are presented in Table 3.2. Although the male variable alone fit the data well, the variable for the percentage of the population living in urban areas improved the fit. The model implies that both a higher population of males aged 15 to 34 and urbanicity are associated with a greater need for alcohol intervention services. When predicting the need for drug intervention, the indicators retained in this model are the same as those for predicting past year illicit drug use. The addition of the density variable improved the fit of the model. More young males and a higher population density are associated with a greater need for drug intervention.[4]

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[2]Intercepts were allowed to vary across Maine and Vermont to account for differences in the mean values of the substance use measures. However, the association between the predictors and the response variables is the same for both states.

[3]The correlation between the variables for males aged 15 to 34 years and for density was r = .47.

[4]The correlation between the variables for males aged 18 to 34 years and for urbanicity was r = .59.

3.4.3 Best Fitting Models for Predicting Treatment Need

As shown in Table 3.2, the only variable retained in the alcohol treatment need model was males aged 15 to 34 years. No additional variables improved the fit. As with all other models, a greater concentration of young males is associated with a greater treatment need. Similarly, the only variable necessary to predict drug abuse treatment need was males aged 15 to 34 years. As can be seen in the correlation table (Appendix C), this outcome had the fewest social indicators with moderate to high associations. This model had the lowest model *p*-value ($p = .0609$), demonstrating a poor to marginal overall fit. This is likely due to the low level of variability in this measure (only 1.9% of the statewide population reported a need for drug abuse treatment).

Table 3.2 Best Fitting Models for Predicting Substance Use and Need for Intervention or Treatment (unstandardized parameters)

Outcome Measure	Intercept	Males Aged 15 to 34 Years[a]	Urbanicity[b]	Density[c]	Model *p*-Value[d]
Past year heavy drinking	-3.84	.107**	–	–	.1059
Past year illicit drug use	-3.42	.0698**	–	.00154**	.3924
Alcohol intervention need	-2.30	.0411**	.00501*	–	.5718
Drug intervention need	-4.45	.0736**	–	.00235**	.3729
Alcohol treatment need	-4.67	.141**	–	–	.3799
Drug treatment need	-5.87	.134*	–	–	.0609

[a]Percentage of total population who are males aged 15 to 34 years.
[b]Percentage of total population living in areas defined as urban.
[c]Average number of inhabitants per square mile of land area.
[d]Values exceeding .10 are considered an excellent fit because the proportion of unexplained variance is low.

* $p < .05$.
** $p < .001$.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

3.5 Region- and County-Level Prevalence Estimates

By applying the parameters from the logistic models described in the preceding section to the social indicator values, it is possible to generate estimates of the outcome measures (i.e., prevalence rates) for each region and county in the state. Comparing the prevalence rates obtained from the social indicator study with the rates obtained from the household survey is useful for judging the success of the modeling procedures. In Table 3.3, we present findings from the two studies to demonstrate how well the social indicator models worked to reproduce

the prevalence rates. We present findings by the three regions representing the Office of Substance Abuse's service catchment areas. The county compositions of the regions are defined in Appendix D. As shown, the model-derived regional rates are very similar to the regional rates obtained from the telephone household survey data. In general, the regional rates from the two approaches are within 1% of each other.

Table 3.3 Comparison of Model-Derived Prevalence Rates with Rates Obtained from the Household Survey for Adults Aged 18 or Older

Region	Social Indicator Study Estimates	Telephone Household Survey Estimates[5]	Social Indicator Study Estimates	Telephone Household Survey Estimates
	Heavy Drinking in the Past Year (%)		Any Illicit Drug Use in the Past Year (%)	
Region I	9.69	10.07	12.16	11.90
Region II	8.79	9.04	9.48	10.28
Region III	10.03	9.14	9.15	8.12
	Need for Alcohol Intervention (%)		Need for Drug Intervention (%)	
Region I	20.17	19.72	6.01	5.41
Region II	18.00	18.85	4.15	4.56
Region III	18.76	17.36	3.74	3.78
	Need for Alcohol Treatment (%)		Need for Drug Treatment (%)	
Region I	7.27	7.89	2.09	2.17
Region II	6.38	6.30	1.83	2.06
Region III	7.64	6.96	2.20	1.74

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

County-level prevalence estimates also were calculated from the regression coefficients. The estimated percentage of heavy drinkers, illicit drug users, and adults in need of alcohol and drug intervention or treatment are included in Table 3.4. The rates of heavy alcohol and any illicit drug use ranged from 7.17% to 10.95% and from 7.14% to 13.27%, respectively. The rates for need for intervention ranged from 14.13% to 20.88% for alcohol and from 2.79% to 6.82% for drugs. The need for treatment estimates are smaller, ranging from 4.83% to 8.58% for

[5]Telephone household survey estimates may differ from those presented in the telephone household report because of county-level reweighting.

alcohol and 1.39% to 2.47% for drugs. Counties with high prevalence rates for one measure of substance use tended to have high rates for other measures. In addition, by knowing the proportion of people with both alcohol *and* drug problems, we were able to estimate the percentage of people in each county who need either alcohol *or* drug treatment. As seen in Table 3.4, these values ranged from 14.13% to 23.92% for alcohol or drug intervention and from 5.14% to 9.97% for alcohol or drug treatment. These rates are useful for determining the overall proportion of the adult population needing substance abuse services in each county.

By multiplying the adult populations (aged 18 or older) of each county by the prevalence rate, it was possible to generate estimates of the number of adults in each county or region who met the definition for each outcome measure studied. The estimated numbers of adults per county and region are included in Appendices E and F.

It is important to keep in mind that the estimates generated by the model are only estimates and should not be interpreted as precise levels of the prevalence rates in question. Each estimate has an unknown amount of error associated with it, and differences between counties with relatively close values, or between a county and the statewide average, may not be particularly meaningful. Because the estimated prevalence rates are subject to estimation error, we also have converted the estimates for counties to rank from 1 through 16. The use of ranks helps to discourage the interpretation of the prevalence rate estimates as fixed or precise quantities. These rank values are provided in Appendix G. Similarly, rank values for the regions are provided in Appendix H.

3.6 Estimating Levels of Substance Use Measures Based on Indicator Values

Social indicator modeling has been proposed as an alternative to expensive and laborious annual data collection as a method for obtaining and updating information on the proportion of the state population expected to need substance abuse treatment or intervention. We can expect that over time the findings from the Maine household survey will no longer be valid as trends in substance use lead to increases or decreases in the proportion of the adult population with substance abuse problems. However, in the future, we can use the information on the association between the indicators and substance use measures that was obtained from modeling to estimate levels of substance abuse problems in Maine counties. Based on the results of the logistic regression models, we know that variation in countywide levels of substance use is associated with variation across the counties in the distribution of young males, urbanicity, and population density. The relationship between the social indicators and the outcome measures may then be expressed using a standardized effect. (We can expect the associations found in the current models to be valid in the near future.) The standardized effect is a scaled measure of the association between the social indicators and the outcome measures (e.g., substance use,

Table 3.4 Predicted Prevalence of Alcohol and Drug Use Measures, By County

	Predicted Prevalences							
County	Heavy Drinking in the Past Year (%)	Any Illicit Drug Use in the Past Year (%)	Need for Alcohol Intervention (%)	Need for Drug Intervention (%)	Need for Alcohol Treatment (%)	Need for Drug Treatment (%)	Need for Alcohol or Drug Intervention (%)	Need for Alcohol or Drug Treatment (%)
Androscoggin	9.82	11.79	20.88	5.66	7.40	2.12	23.34	8.44
Aroostook	10.67	9.33	19.37	3.77	8.28	2.38	19.94	9.58
Cumberland	10.07	13.27	20.40	6.82	7.66	2.20	23.92	8.78
Franklin	8.90	8.34	16.23	3.34	6.48	1.86	16.37	7.26
Hancock	8.62	8.32	16.43	3.36	6.20	1.78	16.59	6.90
Kennebec	8.88	9.82	18.88	4.34	6.45	1.85	20.02	7.22
Knox	7.54	8.42	16.52	3.58	5.18	1.49	16.90	5.59
Lincoln	7.17	7.77	14.13	3.20	4.83	1.39	14.13	5.14
Oxford	8.06	7.90	15.77	3.16	5.66	1.62	15.77	6.20
Penobscot	10.95	9.91	20.46	4.12	8.58	2.47	21.38	9.97
Piscataquis	7.23	7.14	15.21	2.79	4.89	1.40	15.21	5.21
Sagadahoc	10.16	10.69	19.49	4.78	7.75	2.23	21.07	8.90
Somerset	8.62	8.12	17.28	3.23	6.21	1.78	17.31	6.91
Waldo	8.14	8.21	16.01	3.35	5.75	1.65	16.16	6.31
Washington	8.13	7.82	15.36	3.10	5.73	1.64	15.36	6.29
York	9.10	10.47	19.82	4.78	6.68	1.92	20.50	7.52
Statewide	9.42	10.30	18.94	4.67	7.02	2.02	20.28	7.96

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

treatment needs) and represents the expected change in the outcome measure associated with a one standard deviation change in the social indicator. For example, if the standardized effect for a social indicator is 1.5, this indicates that a one standard deviation increase for that indicator is associated with an increase of 1.5 times the odds for the outcome measure.

Below we discuss the estimated degree of association between county levels of substance use measures and the social indicators. In Tables 3.5 through 3.7, we present the indicators retained in the best fitting models for predicting substance use and treatment needs, the range of values across the counties found for that indicator, and the value of the response variable associated with the state average for the indicator, as well as the value of the response variable when the indicator increases or decreases from the state mean.

3.6.1 Estimating Levels of Substance Use Based on Indicator Values

In Table 3.5, we present the expected values of heavy drinking and illicit drug use based on a 2% increase or decrease in the indicator value. For example, a county with an average value of 14.11% for the variable for males aged 15 to 34 years is predicted to have a value of 8.81% for the heavy drinking variable. Consequently, if a county's proportion of young males is 2% lower than the state mean, then its corresponding value for the heavy drinking variable is predicted to be 7.25%. Conversely, if a county's mean value for the variable describing males aged 15 to 34 years is 2% higher than the state mean, then the associated value of the heavy drinking variable is calculated to be 10.68%. A similar scenario is presented for illicit drug use. The percentage of males aged 15 to 34 years and the population density are used to predict the level of illicit drug use across the state. For a county with an average value (14.11%) of males aged 15 to 34, the expected prevalence rate for illicit drug use is 9.10%. For a county with a 2% greater percentage of young males, the corresponding prevalence rate for illicit drug use is 10.32%, whereas a 2% lower percentage of males is associated with a prevalence rate of 8.01%. (When more than one indicator is contained in the model, the estimate is based on the second variable being equal to the state mean.) A county with an average population density (83.41 persons per square mile) has an estimated prevalence rate for illicit drug use of 9.10%. In contrast, a county with a higher density (50 *more* persons per square mile) is estimated to have a prevalence rate for illicit drug use of 9.75% and a county with a lower population density (50 *fewer* persons per square mile) has an estimated prevalence rate of 8.48%.

Table 3.5 Association Between Indicator Values and Heavy Drinking and Illicit Drug Use

Outcome: Heavy Drinking			
Indicator	**Indicator Range[a]**	**Indicator Value[b]**	**Heavy Drinking Value (%)[c]**
Males	11.99% to 16.36%	14.11%	8.81
		12.11%	7.25
		16.11%	10.68
Outcome: Any Illicit Drug Use			
Indicator	**Indicator Range[a]**	**Indicator Value[b]**	**Heavy Drinking Value (%)[c]**
Males	11.99% to 16.36%	14.11%	9.10
		12.11%	8.01
		16.11%	10.32
Density	4.68 to 296.80 persons per square mile	83.41	9.10
		33.41	8.48
		133.41	9.75

[a]Observed range of values for the indicator.

[b]Observed mean value for the variable for males aged 15 to 34, followed by observed mean minus 2% and observed mean plus 2%; observed mean value for the density variable, followed by observed mean minus a rate of 50 persons per square mile and observed mean plus a rate of 50 persons per square mile. Different indicator value levels were selected to reflect realistic trends with a potentially significant impact on the treatment need values.

[c]Model-predicted value.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

3.6.2 Estimating Levels of Intervention Needs Based on Indicator Values

As illustrated above, parameter estimates from the logistic regression models may be used to estimate the county-level need for substance abuse intervention. Again, the proportion of males aged 15 to 34 and urbanicity were the indicators with the strongest association with measures of alcohol intervention need, while the proportion of young males and density were the indicators with the strongest association with measures of drug intervention need. As seen in Table 3.6, the need for alcohol intervention varied from 16.33% to 18.71% based on a 2% increase or decrease from the state mean in the percentage of the population who are young and male. The percentage of the population in need of alcohol intervention ranged from 16.78% to 18.22% based on a 10% increase or decrease from the state mean in the percentage of the population living in an urban area.

Table 3.6 Association Between Indicator Values and Intervention Needs

Outcome: Alcohol Intervention			
Indicator	**Indicator Range[a]**	**Indicator Value[b]**	**Alcohol Intervention Value (%)[c]**
Males	11.99% to 16.36%	14.11%	17.41
		12.11%	16.33
		16.11%	18.71
Urban	0.00% to 67.88%	33.13%	17.49
		23.13%	16.78
		43.13%	18.22
Outcome: Drug Intervention			
Indicator	**Indicator Range**	**Indicator Value**	**Drug Intervention Value (%)**
Males	11.99% to 16.36%	14.11%	3.85
		12.11%	3.34
		16.11%	4.43
Density	4.68 to 296.80 persons per square mile	83.41	3.85
		33.41	2.44
		133.41	4.31

[a]Observed range of values for the indicator.

[b]Observed mean value for the variable for males aged 15 to 34, followed by observed mean minus 2% and observed mean plus 2% (for males); observed mean value for the variable for the population living in urban areas, followed by observed mean minus 10% and observed mean plus 10% for urbanicity; observed mean value for the density variable, followed by observed mean minus a rate of 50 persons per square mile and observed mean plus a rate of 50 persons per square mile for density. Different indicator value levels were selected to reflect realistic trends with a potentially significant impact on the treatment need values.

[c]Model-predicted value.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

3.6.3 Estimating Levels of Treatment Needs Based on Indicator Values

Finally, we used the same procedures to examine levels of alcohol and drug treatment needs based on variation in the proportion of males aged 15 to 34 across counties (see Table 3.7). Age and gender were the only indicators needed to obtain a good-fitting model. For a county with percentages of young males at the mean level (14.11%), the associated need for treatment is 6.40% for alcohol and 1.84% for drugs. For a county whose Census-based indicator of young males is 2% lower than the average, the corresponding value for treatment need decreases to 4.90% for alcohol and 1.41% for drugs. Conversely, for a county whose proportion

Table 3.7 Association Between Indicator Values and Treatment Needs

Outcome: Alcohol Treatment			
Indicator	**Indicator Range (%)[a]**	**Indicator Value (%)[b]**	**Alcohol Treatment Value (%)[c]**
Males	11.99 to 16.36	14.11	6.40
		12.11	4.90
		16.11	8.30
Outcome: Drug Treatment			
Indicator	**Indicator Range (%)**	**Indicator Value (%)**	**Drug Treatment Value (%)**
Males	11.99 to 16.36	14.11	1.84
		12.11	1.41
		16.11	2.39

[a]Observed range of values for the indicator.

[B]Observed mean value for the variable for males aged 15 to 34, followed by observed mean minus 2% and observed mean plus 2% for males aged 15 to 34.

[c]Model-predicted value.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

of males aged 15 to 34 is 2% higher than the state average, the estimated need for substance abuse treatment rises to 8.30% for alcohol and 2.39% for drugs.

3.7 Summary

In this chapter, we have provided the results of the factor analysis used to reduce the large number of social indicators to a smaller number of constructs representing the full set. Six factors representing various aspects of community sociodemographics, health, and safety emerged. We used the smaller set of indicators in logistic regression models to produce estimates of heavy drinking, illicit drug use, need for alcohol or drug intervention, and need for alcohol or drug treatment that would replicate, as closely as possible, the findings from the household survey.

Results from the modeling suggest that three social indicators—the proportion of males aged 15 to 34, the population density, and urbanicity—significantly predict various measures of substance abuse risk or intervention/treatment needs. The young male variable alone is all that is needed to model heavy drinking and alcohol and drug treatment needs. Population density adds to the predictive model for illicit drug use and drug intervention needs, while urbanicity enhances

the model used to predict alcohol intervention needs. Although many other social indicators are associated with substance use, these variables provide the best fit. Parameter estimates from the regression models were used to calculate the proportion of adults using or abusing substances. These prevalence rates were compared to those obtained from the telephone household survey.

Our findings suggest that social indicator modeling appears to be a useful proxy for estimating substance use prevalence and treatment needs in the absence of survey data (once the models have been calibrated to available survey estimates). Finally, we showed how information on the association between social indicators and the outcome measures can be used to estimate changes in substance use prevalence and treatment needs by county. In Chapter 4, we discuss both the limitations and the potential utility of social indicator modeling for treatment planning and resource allocation decisions.

4. SUMMARY AND IMPLICATIONS

This study determined whether social indicator modeling can serve as an alternative to annual survey data collection to estimate and update county-level prevalence for substance abuse planning and resource allocation decisionmaking. Social indicators have a long history of use in health planning and are valued because they contribute rationality and objectivity to the decisionmaking process (McAuliffe et al., 1993). The underlying premise of social indicator approaches is that existing information is already available about the social, demographic, and economic characteristics of counties or planning areas that are associated with substance use and need for treatment.

In Chapter 1, we introduced two topologies for indirect data collection: synthetic estimation and social indicator modeling. We hypothesized that social indicator modeling would be more effective than synthetic estimation procedures for predicting substance abuse and treatment needs because it expands beyond strictly demographic predictors and incorporates alcohol- or drug-related variables (e.g., alcohol-related traffic accidents). This approach was recommended by the National Technical Center (NTC) for Substance Abuse Needs Assessment because the inclusion of indicators with high face validity such as alcohol- and drug-related crime, morbidity, and mortality was believed to enhance the predictive abilities of the planning models (McAuliffe et al., 1993). However, in this study, we found that the addition of alcohol- and drug-related indicators does not offer predictive utility over and above the inclusion of simple demographic information. Thus, models employing neighborhood characteristics similar to those described in social disorganization theory appear very effective in predicting communities with high levels of substance abuse problems (Simeone et al., 1993).

4.1 Summary of Findings

Population characteristics describing males aged 15 to 34 years, density, and urbanicity were the only variables needed to obtain good-fitting predictive models. With one exception, the fit of the models to the response variables was good, and the addition of other predictors to the models did not significantly improve the statistical fit of the models. The strongest predictor for all the models was the proportion of the population who are males aged 15 to 34.

When estimating illicit drug use and need for drug intervention, in addition to males aged 15 to 34, county population density also added significantly to the prediction. Thus, in Maine, problem drug use is more likely to occur in densely populated counties with a greater number of young males. Alcohol-related outcomes were significantly predicted by the variable for males aged 15 to 34 and urbanicity (for alcohol intervention only). As such, urban counties with

greater proportions of young males are more likely to need alcohol intervention services. The prediction of drug treatment needs was the only model with a poor overall fit (model *p*-value = .0609).

Parameter estimates from the logistic regression equations were used to estimate the prevalence of the substance use and misuse measures within each county and planning region in Maine. A comparison of the model-derived estimates with the household survey estimates shows that they generally differed by less than 1%. These results are very encouraging and highlight the potential application of this method for generating county-level estimates of treatment or intervention needs in the absence of annual population surveys. Using the knowledge gained from the modeling on the associations between the indicators and the substance use measures, we also were able to examine the degree to which changes in the indicator variables were linked with changes in the need for treatment or intervention variables. This information may be used by health planners to gauge differences in treatment needs across counties with different social indicator levels. In addition, this information may be used to project how changes in county sociodemographics may be linked with changes in service needs over time.

4.2 Interpretation of Results

There are several possible reasons why only a few indicators were retained as significant predictors in the models. First, the variable for males aged 15 to 34 was highly correlated with several other indicators, including residential instability, density, crime, and sexually transmitted disease (STD). Thus, the male variable appears to reflect a more global construct of social pathology or disorder. When the male variable was included in the model, it showed the strongest relationship with the outcome measures and left little opportunity for the other indicators to add unique variance to the prediction of substance use and misuse. Second, the state of Maine is quite homogeneous. That is, across the counties, there is less variation in sociodemographic characteristics than is true for many other states. In a state with more heterogeneity, it is likely that other indicators would emerge as significant predictors of the need for substance abuse services across the various counties. However, given the relative similarity across counties and the small number of significant indicators, we were still able to generate successful models for reproducing estimates of treatment service needs.

The regression modeling results do not imply that the many indicators that were not selected for the final models are irrelevant but rather that their contribution to predicting levels of treatment needs may overlap with the contributions of the selected variables. Results from the factor analysis indicate that many of these variables are redundant in that they appear to be measuring the same construct. When these variables were added to the model, the high degree of association among the indicators resulted in only a small number of variables offering an

independent contribution to the prediction of treatment needs. Given that many of these variables are tapping the same construct, it is likely that selected indicators could be replaced with other similar (i.e., highly correlated) indicators without substantively affecting the model-based estimates. Although the proportion of young males in a county appears to be the most useful predictor of substance abuse problems, many of the other indicators of social disorder, including density, urbanicity, residential turnover, and renter occupancy, are useful proxies for identifying communities at risk for substance abuse. A large body of evidence supports the use of these indicators in differentiating neighborhoods with high degrees of social problems (e.g., violence, teen pregnancy, school dropout) (Simeone et al., 1993). Our results support the utility of these indicators, yet conclude that for prediction purposes, a more parsimonious subset of these variables is effective in determining rates of substance abuse treatment needs.

The social indicators that correlated with alcohol-related treatment needs were similar to those that correlated with drug-related treatment needs. The population size and the proportion of young males in a county were significant predictors in modeling both alcohol- and drug-related service needs. This is somewhat surprising given that alcohol- and drug-related treatment or intervention needs are not significantly correlated with one another. That is, it appears that individuals with alcohol abuse problems are a different population from those with drug abuse problems. We decided to model alcohol- and drug-related outcomes separately because research suggests that some indicators may be more relevant to the need for alcohol treatment while others may be more relevant to the need for drug treatment (e.g., the prevalence of injection drug-related human immunodeficiency virus [HIV]/acquired immune deficiency syndrome [AIDS] cases). Separate models also are important because drug problems are more often concentrated in specific communities, while alcohol problems are generally dispersed throughout the state (McAuliffe et al., 1993). Finally, for planning purposes, separate estimates of alcohol versus drug treatment needs are useful because treatment and ancillary services may vary depending on the primary substance of addiction. Despite the differences in alcohol- versus drug-abusing clients, planning is facilitated by the finding that service needs for both alcohol and drugs can be predicted by similar social and demographic constructs.

4.3 Future Considerations

One of the important policy issues yet to be resolved is the choice of outcome measures that are most relevant and appropriate for the state's planning and resource allocation decisions. If those planning decisions are most directly pertinent to substance abuse *treatment* services, as traditionally defined, then the models of treatment needs might be most appropriate. However, this choice must be balanced with the consideration that the other models (i.e., the need for intervention and the prevalence of use) are based on outcomes in which we have more confidence in their measurement because of the larger number of people on which they are based.

Fortunately, as depicted in Table 4.1, the correlations between estimates of use, treatment needs, and intervention needs are all positive and statistically significant (except for drug treatment need and core illicit drug use). This finding further highlights the consistency in the results across the various models, thus enhancing confidence in the overall validity of the approach used for this study.

We want to stress the utility of continuing to collect an array of social indicators, even though only a few of the indicators were retained in the final models. As discussed earlier, the redundancy in these variables limited their combined utility in model building. The social, economic, and demographic characteristics of communities provide extremely valuable information for planners and other service providers for assessing levels of community health and risks for social problems, including substance abuse. This descriptive information is useful for characterizing communities and generating profiles of potential service users. Furthermore, the application of these models to estimating levels of substance abuse need is contingent on the continued updating of social indicator data.

Table 4.1 Correlations Among Substance Use and Treatment and Intervention Needs: State of Maine

Outcome Measure	Heavy Drinking	Illicit Drug Use	Alcohol Intervention	Drug Treatment	Alcohol Treatment	Drug Treatment
Heavy drinking	–	.26	.71**	.39	.52*	.49
Illicit drug use	–	–	.36	.60**	.22	.26
Alcohol intervention	–	–	–	.16	.70**	.11
Drug intervention	–	–	–	–	.04	.85**
Alcohol treatment	–	–	–	–	–	.04
Drug treatment	–	–	–	–	–	–

Note: Estimates are based on a sample size of 16, the number of counties in the state.

*$p < .05$.
**$p < .01$.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

This study has several limitations. First, for most counties, the household survey estimates are based on relatively small samples. Therefore, the survey-based estimates may have large sampling errors, and some attenuation of correlations with the predictors (i.e., the social indicators) would be expected. Ideally, it would be desirable to replicate the findings from this study with another survey of Maine household residents or to compare the findings from this study to those of similar efforts ongoing in other states. We expect that the latter may be possible, as similar analyses are being conducted by Research Triangle Institute (RTI) in several other states. Second, some of the state-collected indicators may contain significant measurement error, thereby limiting their effectiveness in the models. To enhance the use of these indicators in the future, we suggest that state agencies pay careful attention to collecting data in a consistent and reliable manner across all counties of the state.

4.4 Conclusion

In conclusion, findings from this study suggest that social indicators may be useful for health service planning because they are correlated with various measures of substance use and treatment needs. Furthermore, the results show that these outcomes may be successfully modeled by a few easy-to-obtain and reliably measured variables describing the population characteristics of local communities. Contrary to expectations, social indicators such as alcohol- and drug-related morbidity, crime, or communicable disease did little to account for variation in the need for substance abuse services across counties. It is possible that large amounts of measurement errors precluded their usefulness in these models and are the reason why the arrest rates from the Uniform Crime Report (UCR) were not included in the analyses. However, because the aim is to obtain the most parsimonious models to ensure easier application for service planning, the finding that only a limited number of available population-based characteristics is needed to estimate substance abuse prevalence rates is very encouraging. Thus, these findings suggest that in the absence of up-to-date, comprehensive population surveys, social indicator studies may be very useful in estimating differences in substance abuse treatment and intervention needs, both within and across counties in the state of Maine.

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APPENDIX A

Data Definitions, Methodology, and Sources

Data Definitions, Methodology, and Sources

The indicator data used for the analyses described in this report were obtained from a variety of sources by the Maine Office of Substance Abuse (OSA) and forwarded to the Research Triangle Institute (RTI) for cleaning, management, and analysis. This section describes data sources and indicator definitions, summarizes the data collection procedures, and notes any features of the data that may influence how they should be interpreted. Information in this section is organized by source. In some instances, a source agency may have provided more than one kind or set of data. Table A.1 identifies the sources for the data and the indicators presented in this report. All rates and percentages are based on averages of the available data years. In most cases, 5- (1990 to 1994), 6- (1990 to 1995), or 7- (1990 to 1996) year averages are calculated.

A.1 U.S. Bureau of the Census

Demographic data for 1990 on rental properties, vacant properties, mobility, race, density, urban population, poverty, single-parent households, income, and adults without a high school education were obtained from the U.S. Bureau of the Census. These data are based on the Census Bureau's 1990 decennial survey of the U.S. population. The county-level data used for this study were abstracted from the *USA Counties 1994* and *USA Counties 1996* compact discs. A limitation of the census data is that they are several years old and updated only every 10 years. Race, sex, and age group data also were obtained for 1990 to 1994. These figures are estimates based on the 1990 census.

The percentage of residential properties that are renter-occupied and the percentage of all residential properties, rental and private, that are unoccupied use data on the total number of rental units and vacant residential units. Both are divided by the total number of all residential properties. Mobility indicators include the percentage of the population that moved within the past 5 years from a) outside the county and b) from within the same county. Indicators of race, such as the percentage of the population who are identified as white, black, Native American, Asian, or other/unknown are calculated by dividing the total population who classify themselves as such by the total population. Population density, or the average number of inhabitants per square mile of land area, is determined by dividing the total population by the square miles of land per county. The percentage of the population living in urban areas is determined by the population living in areas defined as urban divided by the total population.

Table A.1 Indicators and Data Sources

Indicator	Source
Demographic Indicators (Population, Property, Density, Poverty, Single-Parent Families, Income, and Adults Without High School Degrees)	U.S. Bureau of the Census
Arrests (Alcohol Law Violations, Drug Use or Possession, Drug Sales or Manufacturing, Operating Under the Influence (OUI), Violent Crime, Property Crime, Non-Alcohol or Other Drug [AOD] Crime)	Federal Bureau of Investigation (FBI) Uniform Crime Report (UCR) data obtained from the University of Michigan Interuniversity Consortium for Political and Social Research (ICPSR)
Motor Vehicle Fatalities in which Impairment was a Factor and Number of Operating While Under the Influence (OUI) Tests	Bureau of Highway Safety, Department of Public Safety
Admissions to Treatment Programs	Maine Office of Substance Abuse (OSA)
Alcohol- and Drug-Related Deaths, Migration, Divorce, Teen Births, and Teen Pregnancy	Office of Data, Research, and Vital Statistics (ODRVS), Department of Human Services (DHS)
Hospital Admissions/Discharges	Maine Health Data Organization (MHDO)
Voter Registration and Voter Turnout	Secretary of State, Division of Elections
Unemployment and Unemployment Claims	Bureau of Employment Security, Division of Labor Market Information Services, Department of Labor
Temporary Assistance for Needy Families (TANF) and Food Stamps	Bureau of Family Independence, Department of Human Services (DHS)
Retail Liquor Outlets	Bureau of Liquor Enforcement and Licensing, Department of Public Safety
Distance to Nearest Interstate	Research Triangle Institute (RTI)
Dropouts and Achievement Test Scores	Office of Management Information, Maine Department of Education (DOE)
Sexually Transmitted Disease (STD)	STD Program, Department of Human Services (DHS)

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Poverty measures are based on the percentage of all persons and the percentage of all children under the age of 18 in families with 1989 incomes below the federal poverty threshold, which is defined as $12,674 for a family of four. These percentages are calculated by dividing the total number of persons/children below the poverty threshold by the total number of persons/children for whom a poverty status was determined.

The percentage of households headed by a single parent is defined as families with a single head of household (male or female) with no spouse present and children aged 17 years and younger, as a percentage of all families with children aged 17 and younger. Single-parent

households are calculated by summing female- and male-headed households with children aged 17 and younger and dividing by the total number of families with children aged 17 and younger. Median household income is the family income at which 50% of all families have a higher income, and 50% of all families have a lower income. Last, the percentage of adults without a high school degree is determined by dividing the number of adults (aged 25 and older) who completed less than 12 years of school by the total number of persons 25 years and older.

Population data for the following age groups by race (white, black, and other) and by sex were obtained primarily for use as denominators in calculating the indicator rates and percentages:

aged 0-9	aged 35-39	aged 65-69
aged 10-14	aged 40-44	aged 70-74
aged 15-19	aged 45-49	aged 75-79
aged 20-24	aged 50-54	aged 80-84
aged 25-29	aged 55-59	aged 85 and older
aged 30-34	aged 60-64	

Population categories not used for denominators and instead calculated as separate indicators were males aged 15 to 34 and the race categories of whites, blacks, and other.

A.2 Uniform Crime Reporting

Crime and arrest data are collected by the FBI from reports submitted by agencies participating in the Uniform Crime Reporting (UCR). The agency-level files are aggregated to the county level by the Interuniversity Consortium for Political and Social Research (ICPSR). Arrest data must be interpreted cautiously for several reasons. First, the number of arrests almost always underestimates the true incidence of criminal activity because many crimes do not result in an arrest. Second, the likelihood of an arrest for a given crime may be influenced by local policies, police practices, and law enforcement resources. Third, if multiple crimes are involved, the arrest is classified according to the most serious crime committed. Finally, not all agencies report data to the UCR or they report data only sporadically.

Adjustments have been made in the county-level files to compensate for non-reporting agencies. For UCR data through 1993, the number of arrests from agencies that reported between 6 and 11 months of data were weighted to produce 12-month equivalents. Agencies that reported less than 6 months of data for any given year were excluded from the aggregation. The estimated population counts covered by the excluded agencies also were excluded from the population denominators. Arrest rates were deemed unreliable and set to missing for any county in which the coverage index was less than .75.

In 1994, the ICPSR implemented a different algorithm to adjust for incomplete reporting. Data from agencies reporting 3 to 11 months of information were weighted to yield 12-month equivalents. Data for agencies reporting less than 3 months of data were replaced with data estimated by rates calculated from agencies reporting 12 months of data located in the same geographic stratum. A coverage index for each county was constructed by ICPSR that reflects the degree to which data for that county were imputed. The index serves as a combined indicator of the total extent to which data for a given county have been imputed (as a result of agency data being either weighted to compensate for missing months or replaced by stratum-wide estimates). For the purpose of the analyses used for this report, 1994 arrest rates were deemed unreliable and set to missing for any county in which less than 75% of the county's population was covered by UCR reporting agencies. However, no counties fell below the threshold for reliability. Therefore, there are no missing arrest rates.

Data for jurisdictions located in multiple counties are reported in the county containing the largest component of the jurisdiction. Some jurisdictions, such as state parks and some state police agencies, provide data only on a statewide basis. In these cases, data are allocated to counties proportionate to their share of the total state population of the agencies reporting 6 months of data or more. The percentage of arrests for any type of crime that are reported by statewide agencies is small or negligible and thus not a potentially significant source of bias in the county-level arrest rates.

For this report, UCR arrest data were used to construct the rate of adults aged 18 and older and juveniles aged 10 to 17 (per 1,000) who were arrested for alcohol law violations, drug use or possession, OUI, violent crime, property crime, non-AOD crime, and drug sales and manufacturing. Rates were based on a 5-year average (1990 to 1994) and calculated as 1,000 times the annual number of arrests divided by the estimated county population for each appropriate age group.

Some arrest categories are composed of several categories of crime. Juvenile alcohol law violations include OUI, drunkenness, and liquor law violations. Adult alcohol law violations, however, do not include OUI arrests. OUI arrests were used as a separate indicator. Violent crime includes homicides, aggravated assault, and robbery while property crime includes burglary, larceny, theft, arson, and motor vehicle theft. Non-AOD crime includes assault, embezzlement, crimes against the family, forgery, fraud, gambling, disorderly conduct, other traffic offenses, prostitution, sex offenses, stolen property, suspicion, vagrancy, vandalism, and weapons violations (juvenile non-AOD crime also includes running away and curfew violations).

A.3 Bureau of Highway Safety, Department of Public Safety

Motor Vehicle Fatalities in which Alcohol or Drugs were a Contributing Factor: Motor vehicle statistics are compiled from crash, lab, and Medical Examiner's reports, and motor vehicle electronic files. The Traffic Division of the Maine State Police receives all police uniform crash reports from state, county, and local police agencies and forwards copies of this information to the Bureau of Highway Safety. Other data sources (lab and Medical Examiner reports, motor vehicle files) are reviewed by the Bureau of Highway Safety as well and are entered into a database so that detailed records can be obtained. Maine usually only tests for alcohol or drug involvement in a vehicle crash if a fatality occurs. Therefore, these numbers do not reflect an accurate and true picture of alcohol- or drug-related crashes. Data reflect the county in which the fatal crash occurred, not the individual's county of residence.

The percentage of motor vehicle fatalities in which alcohol or drug impairment was judged to be a contributing factor was calculated by dividing the number of alcohol- or drug-related motor vehicle fatalities by the total number of motor vehicle fatalities. Data were available for 1991 to 1995. Fatality data only were extracted from the following reports:

Maine Department of Transportation, Bureau of Maintenance and Operations. 1995. *State of Maine Accident and Highway Facts: 1995 Edition*.

Maine Department of Transportation and Maine Department of Public Safety. 1996. *Maine Highway Crash Facts.*

Operating while Under the Influence (OUI) Tests: The Department of Public Safety receives OUI test information from the Bureau of Motor Vehicles (BMV), which obtains the data from the Department of Human Services's (DHS's) public health laboratory. The public health laboratory collects OUI test information from police department intoxilizers and balloon and blood tests. Intoxilizers, which are located in jails and police departments throughout the state, store data on all the tests that are conducted. Once a week, the public health lab downloads that information via computer. The public health lab (and often private labs), analyzes blood or balloon tests from across the state. Northeast Laboratory Services send hardcopies of analysis reports to the public health lab. In addition to the test information, the Bureau of Motor Vehicle sends the public health lab information on the number of refusals to take the tests (which the BMV receives from police departments). The public health lab enters this information into a database and forwards aggregate information to both the BMV and the DHS.

The number of OUI tests conducted reflects the number of tests performed, not the number of people who failed the test and/or were over the legal limit for alcohol consumption.

For this study, the OUI test rate was calculated by dividing the number of OUI tests performed by the population aged 15 and older, multiplied by 1,000. Data were available for 1992 to 1996.

A.4 Department of Human Resources, Bureau of Family Independence

Clients applying for Temporary Assistance for Needy Families (TANF) and food stamps fill out forms and are interviewed by a DHS Family Independence Specialist. The specialists have access to a mainframe database system (called "WELFRE") and enter client information on a daily basis. Information is reported monthly for both TANF and food stamp recipients by county.

Defined as the unduplicated number of TANF cases and food stamp recipients per month (based on December data) as a percentage of the total population, data were available for 1993 to 1996. Percentages were calculated by dividing the number of TANF cases and food stamp recipients (separate indicators) by the total population.

Sources for these data include the following reports: Department of Human Services. (All years.) Geographic Distribution of AFDC and FS Money Payment. Caseload Giving Unduplicated Counts of Total Recipients by County by Town for (Month, Year), Report AAF070A.

A.5 Department of Human Services, Office of Data, Research, and Vital Statistics

Alcohol- and Drug-Related Deaths: Physicians record causes of death on death certificates that are sent from funeral homes to the Vital Records Unit. The Vital Records Unit contracts out to Humansoft, Inc., a company located in Colorado, to have the causes of death coded and entered into a database. Humansoft, Inc., transmits an American Standard for Computer Information Interchange (ASCII) file to the Office of Data, Research, and Vital Statistics (ODRVS), DHS, where the death data are merged with demographic data.

The cause of death noted on death certificates is categorized according to codes from the International Classification of Diseases (ICD-9). There does not appear to be a standard and uniformly agreed-upon set of codes that indicate whether a death is related to alcohol or drug use. For this study, the source agency compiled data on alcohol- and drug-related deaths based on the following ICD-9 codes (see Table A.2 for code definitions):

Alcohol—303.0-303.9, 291.0-291.9, 305.0, 571.0-571.3, 265.2, 980.9
Drug—292.0-292.9, 304.0-304.9, 305.2-305.9

Table A.2 ICD-9 Codes and Categories for Collecting Death Data

Alcohol and Drug ICD-9 Codes	ICD-9 Code Definitions
Alcohol:	
265.2	Pellagra
291.0 - 291.9	Alcoholic Psychoses
303.0 - 303.9	Alcohol Dependence Syndrome
305.0	Non-Dependent Abuse of Drugs (Alcohol)
571.0 - 571.3	Alcohol-Related Liver Disease
980.9	Toxic Effect of Methyl and Isopropyl Alcohol
Drug:	
292.0 - 292.9	Drug Psychoses
304.0 - 304.9	Drug Dependence Syndrome
305.2 - 305.9	Non-Dependent Abuse of Drugs

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Death data were available for 1991 for 1995. Rates were calculated as 100,000 times the number of alcohol- or drug-related deaths divided by the total population.

Migration: Net migration numbers are based on population estimates derived from 1990 census data. The ODRVS does not develop in-migration and out-migration figures for each county; rather, it estimates the percentage of the population that changes from 1 year to the next, based on population changes evident in the census data. The ODRVS does, however, develop population estimates for non-census years.

Defined as the net change in population due to migration expressed as a percentage of the total population (the population change divided by the total population), data were available for 1991 to 1993.

Divorce: Divorce records are sent by the courts to the Vital Records Unit. There is no specific schedule that is followed and records are sent periodically. The state stopped reporting divorces by county after 1989, and only statewide figures are available from 1990 to the present. Although the office has all the divorce records, the data are not entered into a database and, therefore, county-level data cannot be obtained.

Thus, divorce data were available for 1989 only. The divorce rate per county was calculated as 1,000 times the number of dissolutions and annulments divided by the total population.

Teen Births: Maine's electronic birth certificate system eliminates the need for data entry of birth certificate information. The electronic system was developed by a Colorado company, Humansoft, Inc. The system consists of a facility module placed in each hospital and a system administration module located in the ODRVS. Hospitals enter birth data into a computer file and transmit the data to ODRVS, where a coordinator processes the records. Home birth data also are entered in the ODRVS system. The birth date of the mother is included on birth certificates, allowing for reporting of births to teen mothers.

Data on the number of teen births or the number of live births to women aged 10 to 17, were available for 1990 to 1994. A rate was calculated as 1,000 times the number of live births to teens aged 10 to 17 divided by the total female population aged 10 to 17.

Teen Pregnancy: Teen pregnancy data consists of teen birth (see the Teen Births description above), abortion, and fetal death information. Abortion services providers are required to send abortion certificates to the ODRVS. These certificates are similar to death certificates but contain gestational information and limited patient-identifying information, including age. The data from the certificates are entered by DHS into a database file. Health care providers send fetal death certificates to the same office. Abortion certificates contain data similar to that found on birth and death certificates. Both abortion and fetal death data are entered into databases using FoxPro.

Defined as the number of live births, still births, and abortions per 1,000 women aged 10 to 17, data were available for 1990 to 1994. A rate was calculated as 1,000 times the number of live births, still births, and abortions to females aged 10 to 17 divided by the female population aged 10 to 17.

A.6 Maine Health Data Organization

Alcohol- and Drug-Related Hospital Admissions: Maine law requires hospitals to report in-patient and out-patient unit record data quarterly to the Maine Health Data Organization (MHDO). Hospitals send the data via diskette (ASCII file) and 9-track tape (EBCDIC) to the MHDO, where the data are entered into the Inpatient Maine Health Data Organization database. Alcohol- and drug-related hospital admissions (inpatient) are based on diagnosis-related groups (DRGs). For this study, DRGs for alcohol included 749, 750, and 751. Drug abuse DRGs

included 743, 744, 745, 746, 747, and 748. See Table A.3 for DRG definitions. Out-patient record data require ICD-9 diagnoses codes. Out-patient data were not used in this study.

Data for hospital admissions (in-patient) involving diagnoses related to alcohol and drug abuse were available for 1991 to 1995. A rate was calculated as 100,000 times the number of alcohol- and drug-related hospital admissions divided by the total population. State and federal hospitals are not required to report and, therefore, not included in these data.

Table A.3 DRG Codes and Categories for Collecting Hospital Admissions Data

Alcohol and Drug DRG	DRG Definition/Category
Alcohol:	
749	Alcohol abuse or dependence left against medical advice
750	Alcohol abuse or dependence with complications/ comraderies
751	Alcohol abuse or dependence without complications/ comraderies
Drug:	
743	Opioid abuse or dependence left against medical advice
744	Opioid abuse or dependence with complications/comraderies
745	Opioid abuse or dependence without complications/ comraderies
746	Cocaine or other drug abuse or dependence left against medical advice
747	Cocaine or other drug abuse or dependence with complications/comraderies
748	Cocaine or other drug abuse or dependence without complications/comraderies

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

A.7 Secretary of State, Division of Elections

Adult Population Registered to Vote: After each election, the Secretary of State, Division of Elections, sends a form to the registrars of voters in each town in Maine who maintain voter registration lists for their towns. Using their own records, the registrars fill out the form, noting how many people are registered to vote in that specific town and the number of voters enrolled in each political party. All towns respond to this questionnaire. Once the forms are returned to the Division of Elections, the information is entered into the elections database.

Data for 1990, 1992, and 1996 were extracted from the yearly reports published by the Division of Elections. The percentage of adults registered to vote was calculated by dividing the number of registered voters by the total population aged 18 and older.

Adults Voting in Presidential Elections: Voter turnout data are available by municipality and determined by voter participation in presidential and gubernatorial elections. Votes are tabulated at the town level. Handwritten ballots are tabulated once and recounted by a second person on a tally sheet. Voting machine results are gathered once the voting has been completed. The towns record votes on election result forms and send them to the Secretary of State, Division of Elections, within 3 days of the election. The results are then entered into the elections database. The Division of Elections is required to submit the voting results to the Governor for his signature within 20 days of the election. Votes become official once they are signed by the Governor.

The percentage of adults who voted in the 1992 and 1996 presidential elections was calculated by dividing the total number of votes cast by the total population aged 18 and older. Data were extracted from the Division of Elections Tabulation Reports (these reports are different from the reports mentioned in the Adult Population Registered to Vote description).

A.8 Maine Department of Labor, Division of Labor Market Information Services, Bureau of Employment Security

Unemployment: The Maine Department of Labor calculates the unemployment rate according to a multistep procedure devised by the U.S. Department of Labor (DOL). This procedure comes from the Current Populations Survey (CPS), a monthly household survey of the U.S. population conducted for the U.S. Bureau of Labor Statistics (BLS) by the U.S. Bureau of the Census, of 56,000 selected households. Respondents are interviewed during the reference week to obtain information on the employment status of each household member aged 16 and older. Unemployment national surveys are disseminated to each state that computes information for each Metropolitan Statistical Area (MSA) and individual county. Labor force counts are

based on the state's population, persons aged 16 and older who are working or actively looking for work, and the number of claimants from each local labor force department. Every state uses the same method of computing unemployment rates in order to allow comparisons across states, cities, MSAs, and counties.

Unemployment was defined as the percentage of the labor force not employed. It is reported on an annual basis. Data were available for calendar years 1992 to 1996. Unemployment was calculated by dividing the total number of persons in the labor force, who were unemployed by the total number of persons in the labor force multiplied by 100.

Unemployment Claims: Unemployment insurance provides workers whose jobs have been terminated through no fault of their own monetary payments for a given period of time or until they find a new job. Unemployment payments (compensation) are intended to provide an unemployed worker time to find a new job equivalent to the one lost without major financial distress. Clients applying for unemployment insurance fill out an initial claims form at a local unemployment insurance office. After filing the initial claim, claimants are sent a weekly claim card that they mail to the local office. The information on these forms is data entered by a claims taker into the unemployment insurance mainframe database. The Annual Benefit Recipient data represents an unduplicated count of the number of individuals who received unemployment benefits, not the total number of people who applied. In mid-1997, the Bureau of Unemployment Compensation closed all local unemployment insurance offices and opened three teleprocessing centers where individuals call to apply for unemployment insurance or mail in an application form.

Data for the unduplicated number of persons (per 1,000 persons aged 18 and older) receiving regular unemployment insurance benefits per calendar year were available for 1992 to 1996 and collected at local unemployment insurance offices. The claims rate was calculated as 1,000 times the number of people receiving benefits divided by the population aged 18 and older.

A.9 Maine Office of Substance Abuse

Providers who receive funding from the Maine Office of Substance Abuse (OSA) are required to submit Office of Substance Abuse Data System (OSADS) forms for each client they admit and discharge. These forms provide OSA with demographic, substance abuse, and treatment information. Each client is identified by a unique code (their date of birth plus the last four digits of their Social Security number), which provides unduplicated numbers of admissions.

Data for this study were available for 1990 to 1993 and reflect admission by the county of the individual's residence, not by the county of admission. The data reflect those people admitted to

OSA-funded substance abuse programs and those admitted into a program because of OUI. Defined as the unduplicated number of adults and juveniles (aged 18 and older and aged 17 and younger) in state-supported AOD programs, the rate was calculated as 1,000 times the number of adults in state-supported shelters, detoxification facilities, and regular AOD programs divided by the population aged 18 and older (adults) and aged 17 and younger (juveniles).

A.10 Department of Public Safety, Licensing and Inspection Unit—Liquor

Liquor outlets are required to have an annual license from the state of Maine. Renewal applications are sent to the outlets from the Licensing and Inspection Unit 3 months prior to license expiration. Outlets return the applications with the appropriate fee to the Licensing and Inspection Unit. The applications contain identifying information such as the outlet name, location, and type of service. Hardcopies of the applications are kept on file and the information is entered by Bureau staff into the Licensing and Inspection Unit System database. Data, however, were not compiled by the Licensing and Inspection Unit after 1992, and, therefore, are not available electronically. Data after 1992 would have to be generated by physically counting licenses from files and categorizing them by county.

Data for the number of active liquor licenses currently on record, per capita, were available for 1990 to 1992. The rate per capita was determined by dividing the total number of active liquor licenses (liquor outlets) by the total population.

A.11 Research Triangle Institute

Mileage from the largest municipality in the county to the nearest interstate highway exchange was determined by using a 1996 Rand McNally atlas, which included a state map revealing county lines, interstates, and interstate exchanges. Distance was calculated using a ruler and mileage estimates given on the map, and the largest municipality was determined using 1990 census population figures. Once the mileage for each county was determined by hand, the figures were checked using Internet Expedia maps (available at the www.expediamaps.com web site). Expedia maps provide the shortest route from a specific starting point to the provided destination. Though towns and cities close to the nearest interstate exchange had to be used, Expedia maps provided a way to judge if the hand calculations were feasible. As a final check, the mileage totals were sent to the Maine OSA for confirmation that the appropriate interstate and municipality per county were used.

A.12 Maine Department of Education, Office of Management Information

Dropouts: The Department of Education (DOE) receives a report (*Report of Public/Selected Private School Systems Part II, EF-M-35A Form*) from school superintendents by October 15 of each year. This report covers the previous school year of October 1 to September 30. The year begins October 1, when superintendents must report their total enrollment to the Department of Education. Superintendents then use that enrollment figure as their base number of students and count dropouts from that figure until September 30 of the following calendar year. For example, the report received by the DOE on October 15, 1997, would depict the number of students who had dropped out since October 1, 1996. Dropouts are reported by the grade level at the time of dropout. The DOE enters the dropout data from the EF-M-35A forms into the departmental school system's database.

Defined as the number of students in Grades 9 through 12 who drop out of school in a single year without completing high school, data were available for school years 1989 to 1990 through 1992 to 1993. The dropout rate was calculated as 100 times the total number of dropouts in Grades 9 through 12 divided by the total number of students enrolled in Grades 9 through 12.

Achievement Test Scores: Prior to each year's testing, the DOE holds a training session (through the state ITV system) with test administrators for all schools. Tests are then administered by teachers to the following grades during the following time periods:

- Fourth grade: any time during a 3-week period beginning January 20,
- Eighth grade: any time during a 2-week period beginning the last week of October, and
- Eleventh grade: any time during a 2-week period beginning the last week of March.

A specific sequence of testing must be followed. Most schools conduct the 8 hours of testing during the earlier part of that time period and use the remainder of the time period for make-ups. The completed tests are collected by the school and sent directly to the DOE's contractor, Advanced Systems in Measurement and Evaluation, Inc., located in New Hampshire, where the content sections of the tests are scored. The written portion of the tests are scored by Maine teachers under the supervision of Advanced Systems at two regional scoring centers located in Maine. Advanced Systems compiles the summary data files and sends a 17-page report for each school and district to the DOE. Advanced Systems also sends electronic summary data files so that special reports can be produced as needed.

For this study, data were available for 1990 to 1996. Test scores for grades 4, 8, and 11 consist of the following subjects: reading, writing, math, science, social studies, humanities, and health. Data were available at the school level and aggregated to the county level using the state's school and union codes. Enrollment data were summed by county and the percentage of students enrolled in each school by county was tabulated. School test scores were then weighted by the percentage of students enrolled and summed by county. The weighted county-level reading, writing, math, science, social studies, humanities, and health scores were averaged to provide an overall Grade 4, Grade 8, and Grade 11 score.

A.13 Department of Human Services, HIV/STD Program

All labs are required by law to report positive sexually transmitted disease (STD) tests to the Bureau of Health. The name, age, address, provider name, test date, and result type are sent to the Bureau of Health. Reports can be made in several ways:

- Labs can send a blue, postage-free pre-addressed form, the Confidential STD Laboratory Report.
- Care providers can send a green form, the Confidential STD Case Report.
- Any care provider or lab can call the toll-free Disease Reporting Line (1-800-821-5821).
- The Bureau of Health will accept any other form sent with positive test results.

Reports are received daily and entered into the STD-Management Information System (MIS) program database by human immunodeficiency virus (HIV)/STD staff. The STD-MIS program is offered to all states by the Centers for Disease Control and Prevention (CDC). The reports are electronically transmitted to CDC via modem once a week.

Defined as the number of cases of gonorrhea and chlamydia for persons aged 15 and older, data were available for 1990 to 1993. STD rates were calculated as 1,000 times the number of gonorrhea and chlamydia cases divided by the population aged 15 and older.

APPENDIX B

Social Indicator Values for Each County

Table B.1 Alcohol and Drug Abuse Indicators, by County for Maine[a]

County	Juvenile Liquor Law Arrest Rate	Juvenile Drug Possession Arrest Rate	Adult Liquor Law Arrest Rate	Adult Drug Possession Arrest Rate	Adult OUI Arrest Rate	Alcohol-Related Hospital Discharge Rate	Drug-Related Hospital Discharge Rate	Adult Treatment Admission Rate	Juvenile Treatment Admission Rate	Alcohol-Related Death Rate	Drug-Related Death Rate
Androscoggin	6.46	1.89	2.49	1.85	7.55	347.62	90.51	18.84	6.43	19.41	0.96
Aroostook	6.88	0.79	3.22	1.00	9.17	149.41	27.60	19.04	15.15	19.03	0.24
Cumberland	3.77	1.38	1.82	1.47	10.36	329.92	116.05	15.41	3.49	13.37	0.97
Franklin	4.57	2.27	3.53	2.49	6.80	226.27	50.13	13.31	5.38	10.16	0.00
Hancock	4.54	0.50	2.40	0.99	8.65	263.96	46.68	14.85	4.36	17.76	2.07
Kennebec	3.94	0.87	2.64	1.49	8.97	249.15	86.01	16.29	10.93	12.29	1.19
Knox	5.66	1.77	2.30	3.10	9.47	197.62	62.80	25.85	6.93	18.95	1.08
Lincoln	3.15	0.97	1.11	0.73	6.91	150.35	48.61	18.49	11.41	16.20	1.30
Oxford	1.77	0.74	0.70	0.83	7.08	272.03	52.21	13.26	4.13	16.65	1.89
Penobscot	3.06	0.51	2.21	1.41	10.13	273.37	56.09	15.89	8.52	16.38	0.96
Piscataquis	1.98	0.27	1.16	1.09	9.62	262.10	35.45	22.90	20.53	21.48	1.07
Sagadahoc	9.91	1.63	1.85	1.30	8.93	133.65	34.74	20.73	14.95	8.83	0.00
Somerset	1.61	0.43	1.64	0.92	5.54	223.85	58.81	18.03	15.20	15.29	0.78
Waldo	2.45	0.77	1.36	1.34	7.61	135.41	38.19	19.35	6.62	16.78	0.00
Washington	5.76	0.76	2.68	1.64	11.62	326.69	66.34	17.44	9.26	21.74	0.56
York	4.69	1.74	3.68	2.62	10.70	147.73	49.40	14.63	3.05	9.43	0.36

[a]See Appendix A for indicator definitions and years.

OUI = operating under the influence.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table B.2 Community Disorganization and Transition, by County for Maine[a]

County	Percentage of Renter-Occupied Properties	Percentage of Unoccupied Properties	Divorce Rate	Percentage of Population Registered to Vote	Percentage of Population Voting in Presidential Elections	Percentage of Population that Moved from Outside County	Percentage of Population that Moved Within County
Androscoggin	34.49	8.67	4.94	96.97	53.67	18.55	28.66
Aroostook	24.87	18.36	3.77	94.22	52.29	28.54	24.39
Cumberland	30.67	13.99	3.05	100.00	61.81	25.53	25.96
Franklin	15.20	37.63	4.36	100.00	58.79	19.56	21.23
Hancock	14.69	39.66	3.91	100.00	60.84	25.65	22.51
Kennebec	24.77	15.02	4.83	100.00	55.59	18.09	24.40
Knox	19.89	24.54	4.72	100.00	58.29	21.45	24.12
Lincoln	11.48	31.76	4.40	100.00	67.03	21.25	16.76
Oxford	16.17	32.42	4.40	100.00	57.84	19.10	25.50
Penobscot	26.70	11.89	4.41	97.27	55.81	20.18	25.69
Piscataquis	11.67	45.48	4.33	99.26	55.64	15.66	22.78
Sagadahoc	25.09	14.02	5.72	97.97	59.16	33.29	16.89
Somerset	16.89	25.73	5.18	100.00	52.39	17.33	25.71
Waldo	14.75	23.27	5.03	100.00	56.71	20.52	19.31
Washington	14.90	29.84	4.35	97.82	50.42	20.59	20.01
York	21.93	22.63	4.02	100.00	60.15	29.42	21.94

[a]See Appendix A for indicator definitions and years.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table B.3 Levels of Community Crime and Violence, by County for Maine[a]

County	Adult Violent Crime Arrest Rate	Adult Property Crime Arrest Rate	Adult Non-AOD Related Crime Rate	Juvenile Violent Crime Arrest Rate	Juvenile Property Crime Arrest Rate	Juvenile Non-AOD Related Arrest Rate
Androscoggin	0.75	7.07	37.90	1.39	48.64	67.13
Aroostook	1.65	7.05	21.81	1.68	28.82	26.46
Cumberland	1.08	5.92	25.25	1.55	38.90	29.73
Franklin	0.63	8.02	18.57	0.53	26.92	20.79
Hancock	0.77	4.15	18.98	0.54	20.19	15.32
Kennebec	0.82	6.33	24.68	1.00	29.78	31.38
Knox	0.78	4.82	32.74	1.35	33.74	42.10
Lincoln	0.53	3.17	14.35	0.75	12.50	8.66
Oxford	0.88	3.15	14.47	0.45	18.31	14.13
Penobscot	1.13	6.10	19.40	0.70	28.01	22.91
Piscataquis	1.12	3.95	12.76	0.30	13.94	9.69
Sagadahoc	0.60	4.69	18.30	0.48	31.94	34.23
Somerset	0.89	5.99	13.71	0.99	20.95	22.62
Waldo	0.65	4.09	10.46	0.58	16.85	14.26
Washington	2.74	5.50	23.76	0.85	28.18	25.76
York	0.82	5.63	26.73	1.24	33.36	49.51

[a]See Appendix A for indicator definitions and years.

AOD = alcohol and other drugs.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table B.4 Demographic Characteristics, by County for Maine[a]

County	Percentage of Population Who Are Males Aged 15 to 34	Percentage of Population Who Are White	Population Density	Percentage of Population Living in Urban Areas
Androscoggin	15.23	98.72	220.89	67.88
Aroostook	16.09	97.52	12.28	41.95
Cumberland	15.49	98.12	296.80	58.56
Franklin	14.21	99.30	17.46	14.47
Hancock	13.88	99.12	30.73	20.12
Kennebec	14.18	98.98	135.17	51.39
Knox	12.51	99.31	101.41	32.62
Lincoln	11.99	99.50	68.09	0.00
Oxford	13.19	99.39	25.52	16.00
Penobscot	16.36	98.07	43.14	53.38
Piscataquis	12.09	99.17	4.68	16.50
Sagadahoc	15.58	97.97	133.35	47.63
Somerset	13.88	99.31	13.04	32.19
Waldo	13.30	99.38	47.96	18.66
Washington	13.28	95.66	13.97	9.03
York	14.44	98.72	170.10	49.69

[a]See Appendix A for indicator definitions and years.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table B.5 Socioeconomic Deprivation, by County for Maine[a]

County	Percentage of Persons Living Below Poverty Level	Percentage of Children Living Below Poverty Level	Unemployment Rate	Percentage of Households Receiving AFDC	Percentage of Single-Parent Households	Median Income	Percentage of Adults Without a High School Education	Percentage of Population Receiving Food Stamps
Androscoggin	11.35	15.53	7.18	1.95	19.39	$ 31,992	28.22	5.64
Aroostook	14.47	16.69	10.69	1.91	14.80	$ 26,353	29.07	6.92
Cumberland	7.97	10.39	4.54	1.28	17.78	$ 38,822	14.98	3.63
Franklin	12.50	13.52	7.39	1.74	15.76	$ 29,395	20.27	4.87
Hancock	10.04	10.61	7.25	1.03	14.53	$ 29,939	16.71	2.97
Kennebec	10.24	11.94	6.81	1.64	16.88	$ 33,375	21.11	4.76
Knox	11.94	15.25	4.96	1.41	15.38	$ 30,236	19.17	4.06
Lincoln	9.61	10.19	5.33	1.17	14.12	$ 32,224	18.57	3.46
Oxford	12.46	16.12	8.24	1.82	17.61	$ 28,486	23.14	5.23
Penobscot	13.00	15.73	6.76	1.87	17.24	$ 31,584	20.91	4.66
Piscataquis	15.25	18.20	8.74	1.89	15.21	$ 26,315	24.57	5.01
Sagadahoc	7.25	8.95	4.83	1.17	16.47	$ 35,851	18.89	2.99
Somerset	14.49	18.25	9.60	2.30	18.79	$ 26,693	28.06	6.75
Waldo	15.99	18.60	8.01	1.96	16.42	$ 26,780	22.61	5.63
Washington	19.30	24.36	10.86	2.33	19.13	$ 23,822	26.82	7.34
York	6.83	7.80	5.48	1.34	15.04	$ 37,232	20.50	3.53

[a]See Appendix A for indicator definitions and years.

AFDC = Aid to Families with Dependent Children.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table B.6 Alcohol and Drug Availability, by County for Maine[a]

County	Retail Liquor Outlets per Capita	Distance to Nearest Interstate Highway	Arrest Rate for Drug Sales or Manufacturing
Androscoggin	0.003	1	1.25
Aroostook	0.003	42	0.40
Cumberland	0.003	5	0.67
Franklin	0.004	35	1.05
Hancock	0.005	25	0.53
Kennebec	0.002	4	0.77
Knox	0.003	56	0.88
Lincoln	0.005	31	0.42
Oxford	0.004	50	0.96
Penobscot	0.003	1	0.56
Piscataquis	0.004	30	0.54
Sagadahoc	0.002	9	0.51
Somerset	0.004	17	0.62
Waldo	0.003	45	0.59
Washington	0.004	85	0.63
York	0.003	2	0.75

[a]See Appendix A for indicator definitions and years.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table B.7 Academic Failure and Lack of Commitment, by County for Maine[a]

County	High School Dropout Rate	Fourth-Grade Achievement Test Scores	Eighth-Grade Achievement Test Scores
Androscoggin	3.63	256.49	249.18
Aroostook	2.00	275.89	262.32
Cumberland	3.71	293.61	290.54
Franklin	1.97	245.84	196.48
Hancock	3.83	260.91	287.00
Kennebec	2.83	281.91	267.39
Knox	1.96	267.52	282.70
Lincoln	3.27	279.41	282.99
Oxford	4.00	253.60	261.41
Penobscot	3.54	272.64	277.14
Piscataquis	4.11	258.55	232.50
Sagadahoc	3.56	291.17	193.64
Somerset	4.10	248.39	251.00
Waldo	4.47	250.55	251.33
Washington	3.70	223.61	227.84
York	3.52	279.86	268.16

[a]See Appendix A for indicator definitions and years.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table B.8 Problems Indirectly Associated with Substance Abuse, by County for Maine[a]

County	Teen Birth Rate	Teen Pregnancy Rate	Sexually Transmitted Disease Rate
Androscoggin	12.01	16.12	4.44
Aroostook	7.70	9.70	1.63
Cumberland	6.77	13.26	2.96
Franklin	7.39	11.61	4.24
Hancock	5.82	9.97	1.79
Kennebec	6.86	11.10	3.36
Knox	7.69	13.03	2.06
Lincoln	8.05	12.80	2.10
Oxford	10.31	14.84	2.40
Penobscot	7.24	10.71	3.95
Piscataquis	7.72	11.06	0.66
Sagadahoc	7.28	12.42	1.13
Somerset	11.29	15.25	2.40
Waldo	9.67	15.41	1.51
Washington	9.97	12.75	1.75
York	6.96	11.26	1.89

[a]See Appendix A for indicator definitions and years.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

APPENDIX C

Correlations of the Logit-Transformed Responses with the Social Indicators

Table C.1 Social Indicator Correlations with Heavy Drinking

Indicator	Correlation
Drug-related death rate	-0.48989
Percentage of population living in urban areas	0.47618
Adult OUI arrest rate	-0.44009
Percentage of residential properties that are vacant	-0.43594
Percentage of population who are black (1990 Census)	0.42572
Adult violent crime arrest rate	-0.41900
Percentage of population receiving AFDC	-0.41116
Adult drug possession arrest rate	-0.41099
Adult liquor law arrest rate	-0.40410
Percentage of population who are black (1990 to 1994)	0.39847
Percentage of population receiving food stamps	-0.39414
Adult property crime arrest rate	-0.37720
Percentage of population who are males aged 15 to 34	0.36795
Percentage of renter-occupied residential properties	0.35609
Sexually transmitted disease rate	0.34582
Unemployment rate	-0.34389
Density	0.33900
Percentage of population who are Asian (1990 Census)	0.33705
Percentage of population classified as "other" (1990 Census)	0.33119

AFDC = Aid to Families with Dependent Children; OUI = operating under the influence.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table C.2 Social Indicator Correlations with Any Core Illicit Drug Use

Indicator	Correlation
Median family income	0.74349
Percentage of population who are Asian	0.71344
Percentage of population who are males aged 15 to 34	0.70221
Percentage of population aged 25 or older without a high school education	-0.66146
Percentage of residential properties that are renter-occupied	0.62480
Drug-related hospital discharge rates	0.62899
Unemployment rate (1990 Census)	-0.60909
Density	0.58821
Percentage of children living below poverty level	-0.59316
Percentage of population that moved within the county	0.59077
Percentage of population classified as "other" (1990 Census)	0.53695
Percentage of population that moved from outside the county	0.53344
Adult treatment admission rate	-0.51137
Percentage of population living below poverty level	-0.50436
Percentage of population living in urban areas	0.48836
Percentage of population voting in last presidential election	0.48507
Percentage of residential properties that are vacant	-0.47885
Percentage of population who are Native American (1990 Census)	-0.46183
Percentage of population who are black (1990-1994)	0.43910
Percentage of population who are black (1990 Census)	0.38132
Miles to nearest interstate highway exchange	-0.34816

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table C.3 Social Indicator Correlations with Need for Alcohol Intervention

Indicator	Correlation
Percentage of residential properties that are renter-occupied	0.65022
Percentage of population living in urban areas	0.64741
Percentage of residential properties that are vacant	-0.69696
Percentage of population who are males aged 15 to 34	0.63361
Percentage of population who are Asian (1990 Census)	0.57265
Density	0.52912
Percentage of population classified as "other" (1990 Census)	0.51750
Median family income	0.48718
Percentage of population who are black (1990 to 1994)	0.47091
Percentage of population who are black (1990 Census)	0.45780
Percentage of population that moved within the county	0.44065
Unemployment rate	-0.42722
Sexually transmitted disease rate	0.39922
Miles to the nearest interstate highway exchange	-0.33112

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table C.4 Social Indicator Correlations with Need for Drug Intervention

Indicator	Correlation
Median family income	0.74917
Percentage of population who are Asian (1990 Census)	0.74044
Density	0.66726
Percentage of population who are males aged 15 to 34	0.64920
Percentage of residential properties that are renter-occupied	0.65867
Unemployment rate (1990 Census)	-0.63220
Percentage of population that moved within the county	0.63030
Percentage of population living in urban areas	0.61688
Percentage of population aged 25 or older without a high school education	-0.60305
Drug-related hospital discharge rate	0.58423
Percentage of children living below poverty level	-0.57100
Percentage of residential properties that are vacant	-0.55762
Percentage of population classified as "other" (1990 Census)	0.51846
Percentage of population who are black (1990 to 1994)	0.48077
Percentage of population that moved from outside the county	0.46935
Percentage of population living below poverty level	-0.42593
Percentage of population who are black (1990 Census)	0.42285
Percentage of population who are white (1990-1994)	-0.42032
Miles to nearest interstate highway exchange	-0.41677
Percentage of population who are Native American (1990 Census)	-0.38483
Percentage of population who are white (1990 Census)	-0.37876
Adult treatment admission rate	-0.35788
Percentage of population voting in last presidential election	0.33422
Percentage of population classified as "other" (1990 to 1994)	0.32170

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table C.5 Social Indicator Correlations with Need for Alcohol Treatment

Indicator	Correlation
Percentage of population who are males aged 15 to 34	0.67901
Percentage of residential properties that are vacant	-0.51100
Percentage of population that moved within the county	0.50939
Percentage of residential properties that are renter-occupied	0.46646
Percentage of population who are Asian (1990 Census)	0.44930
Unemployment rate	-0.44644
Median family income	0.42289
Drug-related hospital discharge rate	0.41690
Adult treatment admission rate	-0.38344
Percentage of population that moved from outside the county	0.38000
Percentage of population who are black (1990 to 1994)	0.37016
Percentage of population classified as "other" (1990 Census)	0.36961
Percentage of population living in urban areas	0.34219
Percentage of population who are black (1990 Census)	0.33775
Percentage of children living below poverty level	-0.32046
Density	0.31612

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table C.6 Social Indicator Correlations with Need for Drug Treatment

Indicator	Correlation
Unemployment rate	-0.39346
Percentage of population living in urban areas	0.36086
Adult drug possession arrest rate	-0.33697
Median family income	0.33381
Adult violent crime arrest rate	-0.33138
Juvenile violent crime arrest rate	-0.32267

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

APPENDIX D

County Composition and Population, by Region

Table D.1 County Composition and Population, by Region

	1994 Total Population	1994 Population Aged 18 or Older	1994 Population Aged 17 or Younger
Maine	**1,240,280**	**934,595**	**305,685**
Region I	**416,582**	**316,675**	**99,907**
Cumberland	248,009	191,140	56,869
York	168,573	125,535	43,038
Region II	**492,008**	**367,207**	**124,801**
Androscoggin	103,882	77,574	26,308
Franklin	29,645	22,027	7,618
Kennebec	117,262	88,200	29,062
Knox	37,074	28,273	8,801
Lincoln	31,023	23,448	7,575
Oxford	53,031	39,374	13,657
Sagadahoc	33,870	25,070	8,800
Somerset	51,219	37,473	13,746
Waldo	35,002	25,768	9,234
Region III	**331,690**	**250,713**	**80,977**
Aroostook	81,920	61,234	20,686
Hancock	48,837	37,350	11,487
Penobscot	146,501	111,444	35,057
Piscataquis	18,549	13,783	4,766
Washington	35,883	26,902	8,981

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

APPENDIX E

Predicted Numbers of Users, Adults in Need of Treatment, and Adults in Need of Intervention, by County

Table E.1 Estimated Number of Adults Who Use Alcohol or Drugs, by County in Maine

County	Estimated Number of Adults	
	Heavy Drinking in the Past Year	Any Core Illicit Drug Use in the Past Year
Androscoggin	7,618	9,146
Aroostook	6,534	5,713
Cumberland	19,248	25,364
Franklin	1,960	1,837
Hancock	3,220	3,108
Kennebec	7,832	8,661
Knox	2,132	2,381
Lincoln	1,681	1,822
Oxford	3,174	3,111
Penobscot	12,203	11,044
Piscataquis	997	984
Sagadahoc	2,547	2,680
Somerset	3,230	3,043
Waldo	2,098	2,116
Washington	2,187	2,104
York	11,424	13,144
State Total	88,085	96,258

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table E.2 Estimated Number of Adults Who Need Intervention, by County in Maine

County	Estimated Number of Adults	
	Need for Alcohol Intervention	Need for Drug Intervention
Androscoggin	16,197	4,391
Aroostook	11,861	2,309
Cumberland	38,801	13,036
Franklin	3,575	736
Hancock	6,137	1,255
Kennebec	16,652	3,828
Knox	4,671	1,012
Lincoln	3,313	750
Oxford	6,209	1,244
Penobscot	22,801	4,591
Piscataquis	2,096	385
Sagadahoc	4,886	1,198
Somerset	6,475	1,210
Waldo	4,125	863
Washington	4,132	834
York	23,751	6,001
State Total	175,682	43,643

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table E.3 Estimated Number of Adults Who Need Treatment, by County in Maine

County	Estimated Number of Adults	
	Need for Alcohol Treatment	Need for Drug Treatment
Androscoggin	5,740	1,645
Aroostook	5,070	1,457
Cumberland	14,641	4,205
Franklin	1,427	410
Hancock	2,316	665
Kennebec	5,689	1,632
Knox	1,465	421
Lincoln	1,133	326
Oxford	2,229	638
Penobscot	9,562	2,753
Piscataquis	674	193
Sagadahoc	1,943	559
Somerset	2,327	667
Waldo	1,479	425
Washington	1,541	441
York	8,386	2,410
State Total	65,622	18,847

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table E.4 Estimated Number of Adults Who Need Alcohol or Drug Intervention and Alcohol or Drug Treatment, by County in Maine

County	Estimated Number of Adults	
	Need for Alcohol or Drug Intervention	Need for Alcohol or Drug Treatment
Androscoggin	18,106	6,547
Aroostook	12,210	5,866
Cumberland	45,721	16,782
Franklin	3,606	1,599
Hancock	6,196	2,577
Kennebec	17,658	6,368
Knox	4,778	1,580
Lincoln	3,313	1,205
Oxford	6,209	2,441
Penobscot	23,827	11,111
Piscataquis	2,096	718
Sagadahoc	5,282	2,231
Somerset	6,487	2,589
Waldo	4,164	1,626
Washington	4,132	1,692
York	25,735	9,440
State Total	189,520	74,372

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

APPENDIX F

Predicted Number of Users, Adults in Need of Treatment, and Adults in Need of Intervention, by Region

Table F.1 Estimated Number of Adults Who Use Alcohol or Drugs, by Region

Region	Estimated Number of Adults	
	Heavy Drinking in the Past Year	Any Core Illicit Drug Use in the Past Year
I	30,671	38,508
II	32,272	34,796
III	25,140	22,953
State Total	88,083	96,257

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table F.2 Estimated Number of Adults Who Need Intervention, by Region

Region	Estimated Number of Adults	
	Need for Alcohol Intervention	Need for Drug Intervention
I	62,552	19,037
II	66,103	15,232
III	47,027	9,374
State Total	175,682	43,643

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table F.3 Estimated Number of Adults Who Need Treatment, by Region

Region	Estimated Number of Adults	
	Need for Alcohol Treatment	Need for Drug Treatment
I	23,027	6,615
II	23,432	6,723
III	19,163	5,509
State Total	65,622	18,847

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Table F.4 Estimated Number of Adults Who Need Alcohol or Drug Intervention and Alcohol or Drug Treatment, by Region

Region	Estimated Number of Adults	
	Need for Alcohol or Drug Intervention	Need for Alcohol or Drug Treatment
I	71,456	26,222
II	69,603	26,186
III	48,461	21,964
State Total	189,520	74,372

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

APPENDIX G

Rank Order of Estimated Prevalence Values, by County

Table G.1 Ranks of Estimated Rates of Treatment Need Measures (*N* = 16)[a]

County	Alcohol Use	Alcohol Intervention	Alcohol Treatment	Core Drug Use	Drug Intervention	Drug Treatment	Alcohol or Drug Intervention	Alcohol or Drug Treatment
Androscoggin	11	16	12	15	14	11	15	12
Aroostook	14	11	15	10	10	14	10	15
Cumberland	12	14	13	16	15	12	16	13
Franklin	9	6	10	8	6	9	6	10
Hancock	7*	7	7	7	8	7*	7	7
Kennebec	8	10	9	11	12	8	11	9
Knox	3	8	3	9	9	3	8	3
Lincoln	1	1	1	2	4	1	1	1
Oxford	4	4	4	4	3	4	4	4
Penobscot	15	15	16	12	11	15	14	16
Piscataquis	2	2	2	1	1	2	2	2
Sagadahoc	13	12	14	14	13*	13	13	14
Somerset	7*	9	8	5	5	7*	9	8
Waldo	6	5	6	6	7	6	5	6
Washington	5	3	5	3	2	5	3	5
York	10	13	11	13	13*	10	12	11

[a]Counties ranked from 1 (lowest estimated value) to 16 (highest estimated value).
*Counties had equivalent prevalence rates.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

APPENDIX H

Rank Order of Estimated Prevalence Values, by Region

Table H.1 Rank Order of Estimated Prevalence Rates, by Region[a]

Region[b]	Alcohol Use	Core Drug Use	Alcohol Intervention	Drug Intervention	Alcohol Treatment	Drug Treatment	Alcohol or Drug Intervention	Alcohol or Drug Treatment
I	2	3	2	3	2	2	3	3
II	3	2	3	2	3	3	2	2
III	1	1	1	1	1	1	1	1

[a]Regions ranked from 1 (lowest estimated value) to 3 (highest estimated value).

[b]See Appendix G for the county composition of regions.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

APPENDIX I

Updating Maine County-Level Substance Use Estimates Using the Social Indicator Model

Updating County-Level Prevalence Rates and the Number of Adults Estimated to Experience Alcohol and Drug Use/Abuse Outcomes Using the Maine Social Indicator Model

I. Introduction

This report focuses on social indicator modeling as one of several approaches that may be used for generating information on substance use problems among the general adult population in the 16 Maine counties. When substance use data are needed on an annual basis for planning purposes, social indicator modeling may be particularly beneficial as it is less time-consuming and costly than large-scale population surveys, it is capable of providing estimates for small geographic units such as counties, and estimates may be updated as new social indicator and population counts become available.

In this Appendix, we provide an overview of how the following county-level estimates of substance use may be modified to incorporate updated social indicator values and population counts.

- past year heavy alcohol use;
- past year illicit drug use;
- alcohol intervention need;
- drug intervention need;
- alcohol treatment need;
- drug treatment need;
- alcohol or drug intervention need; and
- alcohol or drug treatment need.

Note however that substance use planners should consider that the accuracy of these updated estimates are influenced by the following assumptions:

- the original model is correct;
- the variables are reliably measured; and
- the model parameters are stable over time.

Thus, the estimates are only as good as the model, and planners should take into consideration the limitations of social indicator modeling approaches before utilizing these data in planning or resource allocation decisions.

II. Data Needed for Updating Estimates

The data needed to update the county-level estimates of heavy drinking, past year illicit drug use, alcohol and/or drug intervention, and alcohol and/or drug treatment include the following:

- for each county, the social indicator value of the year of interest for the variables outlined in step 1 below; and
- for each county, the estimate of the adult population for the year of interest.

III. Steps for Updating County-Level Prevalence Rates for Substance Use Outcome Measures

The county-level prevalence estimates of substance use and need for intervention or treatment may be updated by following the steps delineated below:

Step 1: Obtain updated social indicator values

For each of the 16 Maine counties, obtain updated social indicator values for the following three variables which were shown to be the most efficient and effective predictors of Maine substance use outcomes:

Social Indicator	Definition	Source	Internet Site
A. Males 15 to 34	Percentage of the population who is male aged 15 to 34	U.S. Bureau of the Census	Http://www.census.gov/population/estimates/county/casrh
B. Urbanicity	Percentage of the total population living in areas defined as urban	U.S. Bureau of the Census	Http://www.census.gov/population/estimates/county/casrh
C. Population Density	The average number of inhabitants per square mile of land area	U.S. Bureau of the Census	Http://www.census.gov/population/estimates/county/casrh

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Step 2: Compute the logit of the estimated prevalence rate

For each county, compute the logit (a function of the estimate) for each outcome by inserting the new social indicator value from step 1 into the following equations:

Substance Use Outcome	Equation used to calculate the logit of the county-level prevalence estimate
Past year heavy drinking	Logit of the estimated prevalence rate = -3.84+0.107(A)+0(B)+0(C)
Past year illicit drug use	Logit of the estimated prevalence rate = -3.42+0.0698(A)+0(B)+0.00154(C)
Alcohol intervention need	Logit of the estimated prevalence rate = -2.30+0.0411(A)+0.00501(B)+0(C)
Drug intervention need	Logit of the estimated prevalence rate = -4.45+0.0736(A)+0(B)+0.00235(C)
Alcohol treatment need	Logit of the estimated prevalence rate = -4.67+0.141(A)+0(B)+0(C)
Drug treatment need	Logit of the estimated prevalence rate = -5.87+0.134(A)+0(B)+0(C)

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

The outcome of step 2 will produce logit estimates for each of the substance use outcomes for each of the sixteen counties.

Step 3: Invert logit to obtain the proportion of the adult population estimated to experience the substance use outcomes

In step 2, the logits for all 16 counties for each outcome and year of interest are developed. The logits must be inverted to obtain the estimated prevalence rate (or proportion) for each outcome. The inversion equation is as follows, X represents the substance use outcome measure of interest, *e* is the root of the natural logarithm (approximately 2.718282) and is obtained from step 2.

$$\text{Prevelance rate of X} = \frac{e^{\text{logit}(\hat{p})}}{1 + e^{\text{logit}(\hat{p})}} * 100$$

Step 4: Calculate the percentage of the adult population who need alcohol or drug intervention and alcohol or drug treatment (i.e., includes adults who have a problem with alcohol-only, drugs-only, and both alcohol and drugs)

Steps 2 & 3 result in separate estimates of the need for alcohol and drug services. In some circumstances, it may be important to estimate the combined intervention or treatment needs for both alcohol and drugs. Below, we provide equations for the additional steps necessary to provide summed estimates for alcohol and drug intervention need and alcohol and drug treatment need which take into account the overlap between the two groups.

- Percentage of adults needing alcohol or drug intervention = est(need for alcohol intervention) + est(need for drug intervention) - 3.33.

- Percentage of adults needing alcohol or drug treatment = est(need for drug treatment) + est(need for drug treatment) - 0.67.

Step 5: Determine the number of adults in each county estimated to experience the substance use outcomes

Multiply the proportion of adults meeting the outcomes for each county times the updated adult population count to obtain the number of adults in each of the 16 Maine counties estimated to drink heavily, use illicit drugs, need substance abuse intervention, and need substance abuse treatment in the year of interest.

IV. Example: Estimating Substance Use Outcomes in Androscoggin County

Below, we estimate the prevalence rate (or the proportion of the population) and number of adults experiencing the six substance use outcomes in Androscoggin County using the social indicator values presented in Appendix B.

Step 1: Determine the social indicator values

The values used in this example are from Appendix B of this report. Updated social indicator values may be obtained from the U.S. Bureau of the Census.

Step 2: Compute the logits

To obtain the logits, we insert the social indicator values for the percentage of the population who is male aged 15 to 34 (A), the percentage of the total population living in areas defined as urban (B), and the average number of inhabitants per square mile of land area (C). These numbers are multiplied by the parameter estimates obtained from the logistic regression models, summed, and added to the intercept value.

Substance Use Outcome	Equation used to calculate logit	Logit
Past year heavy drinking	Logit of the prevalence rate = -3.84 + 0.107(15.23)+0(67.88)+0(220.89)	-2.210
Past year illicit drug use	Logit of the prevalence rate = -3.42 + 0.0698(15.23)+0(67.88)+0.00154(220.89)	-2.017
Alcohol intervention need	Logit of the prevalence rate = -2.30+ 0.0411(15.23)+0.00501(67.88)+0(220.89)	-1.333
Drug intervention need	Logit of the prevalence rate = -4.45+ 0.0736(15.23)+0(67.88)+0.00235(220.89)	-2.810
Alcohol treatment need	Logit of the prevalence rate = -4.67+ 0.141(15.23)+0(67.88)+0(220.89)	-2.522
Drug treatment need	Logit of the prevalence rate = -5.87+0.134(15.23)+0(67.88)+0(220.89)	-3.829

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Step 3: Invert the logits for each outcome

The logit is a function of the prevalence rate or proportion. It must be inverted as shown in the equation below.

Substance Use Outcome	Inversion of logit	Proportion
Past year heavy drinking	Proportion (prevalence rate) = $e^{-2.210}$ /1+$e^{-2.210}$ = 0.109658 / 1.109658 =	0.0988
Past year illicit drug use	Proportion (prevalence rate) = $e^{-2.017}$ /1+$e^{-2.017}$ = 0.133084 / 1.133084 =	0.1175
Alcohol intervention need	Proportion (prevalence rate) = $e^{-1.333}$ /1+$e^{-1.333}$ = 0.26343 / 1.26343 =	0.2085
Drug intervention need	Proportion (prevalence rate) = $e^{-2.810}$ /1+$e^{-2.810}$ = 0.060206 / 1.060206 =	0.0569
Alcohol treatment need	Proportion (prevalence rate) = $e^{-2.522}$ /1+$e^{-2.522}$ = 0.080253 / 1.080253 =	0.0743
Drug treatment need	Proportion (prevalence rate) = $e^{-3.829}$ /1+$e^{-3.829}$ = 0.021727 / 1.021727 =	0.0213

Note: A standard calculator or spreadsheet package may be used to exponentiate *e* to the logit of X.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

Steps 4 and 5: Calculate the number of adults in each county experiencing the substance use outcomes

The prevalence rate is the proportion times 100 (e.g., 9.88% for past year heavy drinking). The proportions can also be multiplied by the population count to determine the number of adults (aged 18 and over) experiencing each of the substance use outcomes.

Substance Use Outcome	Proportion	Adult Population Count—Androscoggin County	Number of Adults 18 and over Meeting Substance Use Outcomes—Androscoggin County
Past year heavy drinking	0.0988	77,574	7,664
Past year illicit drug use	0.1175	77,574	9,114
Alcohol intervention need	0.2085	77,574	1,6174
Drug intervention need	0.0569	77,574	4,413
Alcohol treatment need	0.0743	77,574	5,764
Drug treatment need	0.0213	77,574	1,652

Note: These numbers differ slightly from those in the report due to rounding differences during calculations.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.

The combined need for alcohol and drug intervention and alcohol and drug treatment may be estimated by summing the independent values and subtracting the combined rate of dual alcohol and drug problems.

Substance Use Outcome	Equation	Prevalence Rate	Number of Adults in Need of Treatment or Intervention in Androscoggin County
Alcohol or drug intervention	(20.85+5.69) - 3.33	23.21%	18,004
Alcohol or drug treatment	(7.43+2.31) - 0.67	9.07%	7,036

Note: These numbers differ slightly from those in the report due to rounding differences during calculations.

Source: Using Social Indicators to Estimate Substance Use and Treatment Needs in Maine: 1999.